Marital Decline: The Role of House Prices and Parental Coresidence

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Abstract

Over the past 40 years in the U.S., marriage rates have declined significantly while parental coresidence among young adults has increased sharply, especially among the non-college educated. At the same time, rising house prices have outpaced income growth, decreasing housing affordability. This paper analyzes how these rising prices influence coresidence and marriage decisions. I first present a stylized model illustrating the dual impact of higher house prices: they encourage marriage due to economies of scale but also lead to more individuals living with parents, decreasing participation in the marriage market. Then, I develop a quantitative life-cycle model of household formation (marriage and divorce) and housing choices (coresidence, renting, and buying). The model economy is characterized by equilibrium in the marriage and housing markets and is calibrated to the 2019 U.S. economy. I use the model for two exercises. First, I quantify the role of house prices on the marital decline between 1980 and 2019. I find that house prices explain around 50% of the decline in marriage within the model. Furthermore, the model can account for the larger drop in marriage among the non-college educated. Second, I evaluate the effect of housing policies and find that a 10% rental subsidy financed by higher taxes can increase marriage rates among young adults by 4 percentage points, primarily by reducing parental coresidence.

Keywords: Marriage market, divorce, parental coresidence, housing market
JEL Codes: D15, J11, J12, R21

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1 Introduction

Over the past 40 years, U.S. households have experienced significant changes. Marriage rates declined, with the share of married or cohabiting women between ages 23 and 49 dropping from 76% in 1980 to just over 60% in 2019. While marriages in the US have declined since the 1950s, two new developments make the post-1980 period distinct. First, a growing share of young adults live with their parents. The share of 23 to 29-year-olds who live with their parents as coresident increased by 17 percentage points, from 15 in 1980 to 32 in 2019. Second, there is a growing educational divide. The share of individuals who are married (or cohabiting) declined by 21 percentage points among non-college-educated adults, compared to 9 points for college graduates. Similarly, parental coresidence among young adults has risen by 20 points for the non-college-educated versus 9 points for those with a degree. Finally, housing has become a growing burden, with house prices rising faster than median incomes. Since 1980, the ratio of house prices to median income has increased by 30%, and the share of rent-burdened households, who spend more than 30% of their income on rent, increased by 12 percentage points.

What are the forces behind the rise in parental coresidence, the decline in marriage, and the growing educational gap in household and marriage structure? Do these changes reflect shifts in preferences, or are they the result of some economic constraints? In this paper, I study the role of house prices in shaping these trends. First, I empirically examine the effects of house prices on the likelihood of young adults living with their parents or being married. Then, I develop a life-cycle equilibrium model of housing and marriage decisions and use it to quantify how much of the overall decline in marriage can be attributed to increasing housing costs between 1980 and 2019. Finally, given the growing political and social interest in the housing crisis in the U.S., I use the model to assess the potential of housing policies to alter these trends in the marriage market. House prices are central to the current analysis for two reasons. First, the increasing difficulty of affording a home may significantly impact the decision to move out of the parental household and start a new one. Secondly, the more significant housing cost burden on non-college-educated individuals might explain the different living arrangements and household formation patterns across education levels.

I first show empirically that house prices affect parental coresidence and marriage decisions. I use individual-level data on living arrangements and marital status from the American Community Survey (ACS) from 2000 to 2019 and the state and Metropolitan Statistical Area (MSA) house prices from the Federal Housing Finance Agency (FHFA). I focus the analysis on the sample of young adults, i.e., individuals between the ages of 23 and 29. Following Chetty et al. (2017), I instrument house prices using a Bartik IV constructed from interacting national house prices with local housing supply elasticities. I find that higher housing prices are associated with a higher probability of living with one's parents and a lower probability of being married or cohabiting with a partner. An increase in one standard deviation of house prices at the state level increases the probability of living with one's parents by 2.1 percentage points and it decreases the probability of being married or cohabiting by 1.4 percentage points.

To better understand the mechanisms behind this empirical result, I present a stylized model of household formation. In the model, higher housing costs make living with a partner more attractive for singles, as they can share the housing costs. How can higher house prices lead to fewer marriages? This happens because higher housing prices also make living with parents a more attractive option. If young adults who coreside with their parents have lower chances of marriage or lower participation in the marriage market, then the overall marriage rate can decline, even if marriage is more attractive for those who do not coreside. Young adults are trading off living with parents versus marriage, and higher house prices make the first option more attractive. The stylized model shows that such changes affect individuals with lower incomes, such as those not college-educated, the most. Hence, the stylized model highlights the interaction between coresidence and marriage decisions: on the one hand, a higher share of coresidents reduces the share of people in the marriage market. On the other hand, not-so-good marriage market prospects reduce the desire to leave the parents' house.

Finally, I build and estimate a life-cycle model of household formation and housing. I use it as a quantitative laboratory to understand changes in household and family structure since the 1980s and evaluate the general equilibrium effects of housing policies. In the model, individuals who differ in their educational attainment choose marriage, divorce, and living arrangements, considering housing constraints and costs. Each period, singles decide whether to live with their parents or live independently. Singles, coresident or independent, meet in a marriage market and decide whether to get married. Being a coresident allows young adults to save on housing costs but implies a utility cost and lowers the chances of meeting other singles. Marriage decisions are dynamic and reflect decisions in the marriage market equilibrium. Married or single, all individuals face idiosyncratic earnings shocks, and all households decide how much to consume and save. They also decide on whether to rent or buy a house. Buying a house can be financed by obtaining a mortgage. Married households also decide whether to divorce, upon which, couples split their assets and any house they own, and this division involves uncertainty about who gets what.

Household decisions generate demand for buying or renting houses, which are met by construction firms and rental agencies. Housing decisions are made considering two relevant constraints. First, there is a minimum housing size. Individuals who want to live independently need to be able to afford, either by renting or owning, the smallest housing unit available. The second constraint is the down payment requirement to obtain a mortgage. Together, these constraints increase saving motives and encourage using the parental coresidence option, especially among young individuals with low or uncertain incomes. The house prices and rents prices are determined by housing market equilibrium. Finally, the government taxes household income and can use tax revenue to implement housing policies. The model economy generates rich heterogeneity where individuals differ in living arrangements, marital status, assets, and housing wealth.

I calibrate the model to match the main features of living arrangements, marital status, and home ownership in the U.S. in 2019. Parameters are set by adopting standard values used in the literature or estimated using a simulated method of moments approach. The benchmark economy does an excellent job of capturing how residence, marriage, and homeownership change along the life cycle for individuals with different educational attainments. I use the calibrated model for two exercises. First, I quantify the role of house prices in changing household and family structure during the past 40 years. Second, I analyze the general equilibrium effects of housing policies on marriage and coresidence.

To account for the role of house prices on marriage dynamics since the 1980s, I compare the benchmark economy with a counterfactual world for the 1980s. The model features the link between housing prices, coresidence, and marriage choices highlighted in the stylized model. It also considers other forces that can account for changes in the coresidence and marriage patterns since the 1980s. First, individuals face stochastic age-earning profiles that differ by gender and educational attainment. Hence, the decline in the gender wage gap, the rise in skill premium, and the growing earnings uncertainty since the 1980s affect household decisions. Second, the educational attainment of the US population has changed significantly since the 1980s. The share of college-educated individuals increased, and much more so for females. Finally, besides house prices, other factors, such as mortgage interest rates, have also changed since the 1980s. The quantitative exercise first simulates the 1980s economy with all these changes in effect and then compares the coresidence and marriage patterns with the benchmark. After that, I change only one of these features to highlight their relative contribution.

I find that my models can account for more than 60% of the aggregate marital decline between 1980 and 2019. It also explains all of the rise in coresidence during this period. Furthermore, the framework is able to account for the differential marital decline across education groups; both in the data and the model, the rise in coresidence and the decline in marriage are much more prone to less educated individuals. Regarding the role of different factors, I find that if the 2019 economy had the 1980 housing costs, the aggregate marital decline would have been only 5 percentage points, compared to the 11 percentage points drop obtained. Hence, house prices account for more than 50% of the overall decline in marriages. The contributions of other factors are smaller.

Finally, I use the calibrated model to conduct two tax-revenue neutral counterfactual housing policies. The first policy is a rental subsidy, while the second is a down payment assistance for young adults. Revenue neutrality is achieved by counteracting the cost of the policy by increasing the taxes on earnings. I examine the effect of the policies on marriage and coresidence across the steady states. The first policy is a rental subsidy for the smallest available rental housing, reducing its cost. This policy encourages individuals to leave their parents' house, increasing the housing demand. However, it also encourages individuals to rent the smallest housing units rather than larger ones, reducing the overall demand for housing. Hence, a priori, it is not clear whether the policy will increase or decrease housing prices. I find that the policy reduces the share of young adult who coreside by 5 percentage points and increases the share of adults who marry by 5 percentage points. The policy reduces homeownership significantly (from 51% to 35%). Yet home prices increase by around only 1%, as, while there is a shift from owning to renting, overall housing demand does not increase much.

Literature. This paper is related to three strands of the literature. The first is the literature that studies the forces behind the marriage decline in the U.S. and other high-income countries. This literature highlights several factors that have contributed to lower incentives to marry, such as the declining gender wage gap (Regalia et al., 1999, Albanesi et al., 2022*a*) and the rising skill premium and earnings volatility (Santos and Weiss, 2016, Ciscato, 2019), which are also considered in the current paper. Greenwood and Guner (2008) and Salcedo et al. (2012) focus on the role of economies of scale and the value of sharing public goods within married households, which also play a role in the current analysis. Finally, in this paper, divorce is associated with uncertain asset division, connecting this analysis to Fernández and Wong (2017) and Lafortune and Low (2023), who focus on the role of changes in divorce laws.

Within this literature, Greenwood et al. (2016) and Blasutto et al. (2023) try to account for the growing education gap in marital outcomes, though much of this education gap remains unexplained. For example, Blasutto et al. (2023) finds that differences in wage structure explain about 18% of the education-based differences in marriage rates. This paper contributes to this extensive literature by highlighting the role of housing constraints and parental coresidence, accounting for a larger share of the increasing educational gap in marriage and cohabitation in recent decades.[1]

Second, the current analysis is linked to a large body of empirical and quantitative work that studies the determinants of parental coresidence. These studies focus on low incomes of young adults (Ermisch, 1999), income and employment uncertainty (Kaplan, 2012, Engelhardt et al., 2016, Grevenbrock et al., 2023), job match quality (Albanesi et al., 2022*b*), indebtedness due to student debt and inability to obtain mortgages (Martins and Villanueva, 2009, Bleemer et al., 2017, Dettling and Hsu, 2018), and parental income and wealth (Ermisch and Di Salvo, 1997). More closely related to the current paper, Luccioletti (2023) studies how coresidence and migration decisions of young adults are affected by the housing market, and how coresidence enables young adults to accumulate assets. The emphasis on house prices in this paper is also shared by Rosenzweig and Zhang (2019), who exploit exogenous changes in housing supply to show that higher house prices increase coresidence and savings rates of young adults. This paper contributes to this literature by analyzing coresidence and marriage decisions jointly.

Finally, this paper is related to recent work studying how household dynamics affect housing markets. Fisher and Gervais (2011), Fischer and Khorunzhina (2019), and Chang (2023) develop frameworks to study the role of changing household formation on the decline in homeownership from the 1970s/1980s to the 2000s. These papers highlight how higher divorce risk can lower homeownership. Meanwhile, Bacher (2023) develops a framework to analyze the portfolio decisions of single agents, who might marry, and couples, who might divorce. She finds that divorce risk encourages couples to save in liquid assets rather than housing. While these papers take marital transitions as an exogenous force, in the current analysis, household structure is endogenous and reacts to changes in the housing market and government policies. This implies that in the current analysis, assets and homeownership decisions affect marriage and divorce decisions. The focus on housing also connects this paper to a larger literature that studies the determinants of homeownership within heterogeneous agent life-cycle models. Sommer and Sullivan (2018), Kaas et al. (2020), and Paz-Pardo

[1]My focus on the decline of marriage among less educated individuals also relates to a large body of empirical studies on the lack of "marriageable" men, which dates back to Wilson (1987). See, for example, Lichter et al. (1992) and Charles and Luoh (2010).

(2024) are examples from this literature.

2 Empirical Analysis: House Prices, Coresidence, and Marriage

In this section, I study empirically the relation between house prices, living arrangements and marital status empirically. First, I present the data and definitions used throughout the paper. Second, I show the historical trends that underpin my research question. I highlight that the non-college educated population has experienced a larger drop in marriage share and a significant increase in parental coresidence share compared to college-educated. Lastly, using ACS data for the 2000-2019 period and an empirical strategies adapted from (Chetty et al., 2017), I show that higher house prices are associated to a higher likelihood of living with parents and a lower likelihood of being married.

2.1 Data and Definitions

I combine different datasets to obtain information on house prices, living arrangements, and marital status from 1980 to 2019.

Sample of interest. Throughout the paper I focus on two sub-samples of the population. The first is the adult population, which is composed of individuals between the ages of 23 and 49. The second group is the young adult population, which is composed of individuals between the ages of 23 and 29. I focus on these samples as they encompass ages where coresidence, household formation, and homeownership choices are more salient.

Demographic Data. Most of the demographic information is retrieved from either the U.S. Census, the American Community Survey (ACS), or the Current Population Survey (CPS).[2] All three surveys are conducted by the U.S. Census Bureau. The census is a decennial survey and I use the 1980 wave, while the ACS is yearly, starting from 2000. These provide information on the demographic, social, economic, and housing characteristics of the U.S. population. The CPS is a monthly survey with information on the labor force, employment, and unemployment. I use the Annual Social and Economic Supplement (ASEC) of the CPS, which is conducted in March of each year.

[2] All three datasets are obtained from the IPUMS database (Flood et al., 2023, Ruggles et al., 2024)

Due to their large sample sizes, the census and ACS enable me to obtain more accurate geographic information, while I use the CPS to obtain consistent yearly information on living arrangements and marital status. For both datasets, I define people as college educated if they finished a college degree, and non-college otherwise. For household level statistics, I always use the education and age of the household head. For statistics on marital outcomes, such as assortative mating, I limit the sample to married individuals of opposite gender.

Incomes. Information on income dynamics and wealth is obtained from the Panel Study of Income Dynamics (PSID). The PSID is a longitudinal survey that follows the same individuals and their descendants over time. It provides information on income, employment, and wealth. In order to obtain a consistent sample across the years, I limit the sample to the Survey Research Center (SRC) sample.

Housing. To obtain information on housing, I use the American Housing Survey (AHS). The AHS is a biennial survey conducted by the U.S. Census Bureau and the Department of Housing and Urban Development. It provides information on housing units, occupants, and the physical condition of the housing stock across the U.S. and for major metropolitan areas. I use the 1980 and 2019 AHS to obtain information on house prices, housing size, and housing tenure. I limit the sample to dwellings that are currently occupied.

House Prices. While the main source of house price information is the AHS, I use a series of additional datasets to obtain time series. The primary source of data across time comes from the Federal Housing Finance Agency House Price Index (FHFA), a broad measure of single-family house prices. The index is a weighted, repeat-sales index, meaning that it measures average price changes in repeat sales or refinancing on the same properties. I also use statistics on house prices across time and place using the data from the Federal Reserve Economic Data (FRED) and the Harvard Joint Center for Housing Studies (JCHS).

Definitions. Individual-level variables, such as coresidence and marital status, compare all people across the sample. Household level ones compare households, and use the household head defined by the survey. An individual is married if their current marital status is married. A household is defined as married if the current marital status of the household head is married, and their spouse is of the opposite gender and present in the sample. I define a person to be never married if they have reported to be never married. The definitions of cohabitation and parental coresidence are based on the relationship to the household head.

Information on cohabitation is provided consistently in the CPS since 1995. I define an individual who is not the household head to be cohabiting if they are the unmarried partner of the household head. If they are the household head, they are considered as cohabiting if an individual in their household said to be the unmarried partner. For the 1980 Census, I use the partner or roommate relationship to define cohabiting individuals. For household heads, I define them to be cohabiting if the household head is cohabiting and their partner is of the opposite gender. I define individuals to be coresiding with their parents if they are the child, stepchild, grandchild of the household head. I apply this definition to any individuals in my sample, i.e., between the ages of 23 and 49. However, statistics on coresidence are presented for ages between 23 and 29.

Finally, to obtain statistics on homeownership and wealth, I only use the household heads. This is done as these variables are at household level.

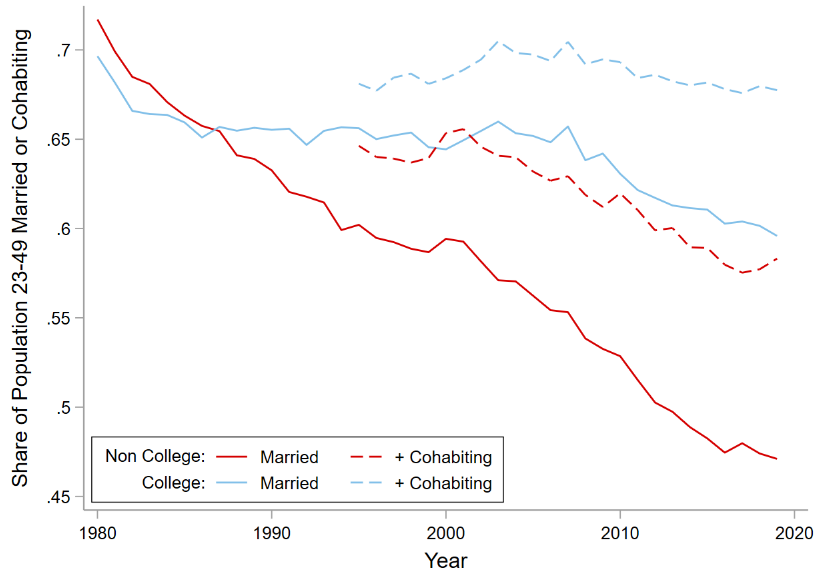
2.2 Historical Trends

This section shows the trends in house prices, parental coresidence, and marriage shares from 1980 to 2019. I highlight that the non-college-educated male population has experienced a larger drop in marriage shares and a more significant increase in parental coresidence share compared to college-educated.

Using the CPS dataset, I analyze the time trends in living arrangements and marital status, across gender and education groups. Figure 1 shows the share of individuals between the ages of 23 and 49 who are married and cohabiting across education groups at the time of the survey. The solid line excludes people cohabiting, while the dashed line includes them. The share of married individuals has fallen drastically, from more than 70% in 1980 to less than 50% in 2019 among non-college-educated and around 60% for the college-educated. When cohabitation is included, the reduction is lower. For the non-college educated, the share of married or cohabiting individuals in 2019 is close to 60%, while for the college-educated, it is around 70%. This divergence between education groups is mainly due to the rise of never married individuals among the non-college educated (Figure A1 in Appendix).

Figure 2 shows the share of individuals living with their parents between the ages of 23 and 29. The red lines are for non-college educated, while the blue is for college-educated. The dashed ones are for males, while the solid are for females. The figure shows that there has been an increase in the share of parental coresidence across all four demographic groups. However, the increase was the largest among non-college-educated: 16 percentage points for males and 13 for females, compared to 7 percentage points among college-educated.

Figure 1: Married and Cohabiting among Adults



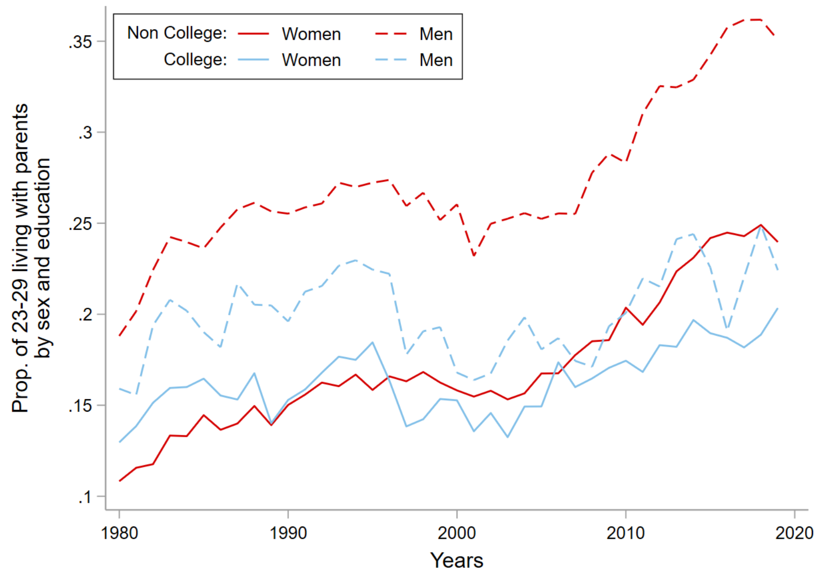
Notes: *The figure shows the time trend of the share of individuals between the ages of 23 and 49 who are married or cohabiting with their spouse across education groups. Data: CPS.*

Using the Census and ACS datasets, we can obtain evidence of the changes in marriage and coresidence across states and metropolitan areas between 1980 and 2019. Across US states, while there is a great deal of heterogeneity in the changes experienced in marriage and coresidence, these changes are not restricted to specific regions. They are a nationwide phenomenon (Figures A2a and A2b in the Appendix). Focusing on metropolitan areas, the rise in coresidence and the decline in marriage are also observed across MSAs with different characteristics (Tables A1 and A2in the Appendix).

House prices in the United States have increased significantly in the past 40 years. Figure 3 shows the time trend of the house price to household median income ratio. The ratio increased from 3.5 in 1985 to 4.5 in 2019. Figure 3 also shows the share of rent-burdened households, defined as the share of households that spend more than 30% of their income on rent (Council of Economic Advisers, 2024). In 1980, only 30 percent of renters were considered rent-burdened. In 2019, a much larger share, 45 percent of them, are. Table A6 in Appendix A documents that the increase in rent-burdened households among non-college-educated between the ages of 23 and 49 has been 16 percentage points, while it was only 7 percentage points for college-educated ones. Furthermore, the increase has been more significant in bigger metropolitan areas.

While house prices have increased throughout the United States, there is some het-

Figure 2: Coresidence Share among Young Adults



Notes: *The figure shows the time trend of the share of individuals between the ages of 23 and 29 who are coresident across gender and education groups. Data: CPS.*

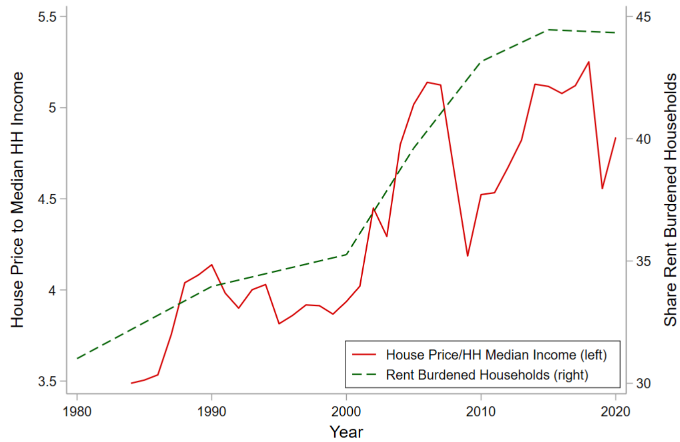
erogeneity across geography and types of houses. The most significant increase in house prices from 1980 to 2019 has been experienced in metropolitan areas in the third and fourth quartiles of the population (Table A5). While the median house price throughout the US increased by around 55%, the increase in the most populated metropolitan areas has been of 69%. Furthermore, house prices have increased the most for large houses with more than four bedrooms (Table A4).[3]

2.3 Role of House Prices on Parental Coresidence and Marriage

The trends highlighted in the previous section show a decrease in the share of married individuals and an increase in coresidence, especially among the non-college educated. At the same time, house prices and the share of rent-burdened households increased significantly. In this section, I use an instrumental variable strategy to estimate the effects of house prices on coresidence and marriage across the US and States and Metropolitan Statistical Areas (MSAs).

[3]For further information on the geographic heterogeneity in housing stock and prices in the U.S. refer to (Baum-Snow, 2023).

Figure 3: House Price to Median Income Ratio



Notes: *The figure shows the time trend of the house price to household median income ratio and share of rent-burdened households. Data: House prices to income is taken from FRED (median sales price over median household income) The rent-burdened share is taken from the Council of Economic Advisers (2024).*

The analysis in this section uses data from the American Community Survey (ACS) from 2000 to 2019. Individuals are coresidents if the household head is their parent or grandparent. I use the share of individuals who are never married to assess marital decline, and an individual is considered never-married if they have reported never being married and are currently not cohabiting. I also obtain information on the state and MSA of respondents from ACS. The house price index at the state and MSA level is obtained from the Federal Housing Finance Agency (FHFA).[4]

The main analysis uses young adults between the ages of 23 and 29. The age limitation is set to focus on the period when coresidence and marriage choices are more salient.[5] However, I show results also when using the sample of adults between the ages of 23 and 49.

Estimating the effect of current house prices on current coresidence and marital status raises two concerns. First, there might be a reverse causality between current state house prices and current demographic variables. House prices might increase, for example, due to reductions in the share of individuals who are coresidents. To mitigate this, I use house prices in the previous year. Second, there might be some omitted variables that affect the

[4] I used the all transactions index. The metropolitan level analysis is done for the period 2005-2019, due to the changes in the metropolitan definitions in the American Community Survey.

[5] In 2019, the share of coresidents is around 40% among 23 years old, 15% among 30 years old, and less than 10% at 40. For never married, the share is more than 80% at age 23, around 40% at 30, and 20% at 40.

relationship between house prices and demographic status. For instance, a stronger labor market or higher migration in a state can increase the state house prices and reduce the share of individuals who coreside. I instrument the lagged house price index to reduce the omitted variable bias.

I follow Dettling and Kearney (2014) and Chetty et al. (2017) and I instrument the state level and metropolitan level house price index using a Bartik style IV. The instrument is constructed by interacting the national house price with a state's housing supply elasticity. The intuition behind the approach is that an aggregate demand shock for housing at the national level has different effects on local housing markets that depend on the local housing supply elasticity. An increase in the aggregate demand for housing will lead to a smaller price increase in housing in a low-elasticity area compared to a high-elasticity one. The use of this instrument requires the assumption that the housing supply elasticities, i.e., the share of the Bartik IV, is exogenous and affects the demographic status only through its impact on house prices (Goldsmith-Pinkham et al., 2020). As a result, I use the measure of housing supply elasticity developed by Saiz (2010), which uses exogenous factors, such as land availability and other geographic features.[6] Furthermore, the inclusion of state-fixed effects in the empirical specification limits the concern that differences in housing supply elasticity might be correlated with other factors that directly affect demographic status.

I estimate the following individual level regression:

$$Y_{it} = \beta_1 HPI_{s_i t-1_i} + \eta_{s_i} + \delta_t + \gamma_1 X_{it} + \gamma_2 X_{s_i t} + \varepsilon_{it}, \tag{1}$$

where i is an individual living in state or metropolitan area s_i and is observed in year t. The dependent variables Y_{it} are dummy variables indicating whether the individual is coresiding or married at the time of the survey.

The main independent variable, $HPI_{s_i t-1}$ is the value of the house price index in the year previous to the survey year in the state or metropolitan area where the individual is currently residing. I control for individual characteristics (gender, education, employment status, race, and log income), X_{it}, time-varying geographic labor shocks using the Bartik instrument, X_{st}.[7]

[6] The elasticity is at the metropolitan level, but Chetty et al. (2017) aggregate it to the state level.

[7] The Bartik control is constructed as $X_{st} = \sum_k \phi_{s,k,\tau} \frac{\nu_{-s,k,t} - \nu_{-s,k,t-1}}{\nu_{-s,k,t-1}}$, where $\nu_{-s,k,t}$ are the national employment shares in industry k at time t computed by excluding the state or metropolitan area $-s$. Meanwhile, $\phi_{s,k,\tau}$ are the employment share in industry k, in state s at fixed time $\tau = 2000$. For metropolitan areas, the fixed time is set to 2005.

Finally, the specification accounts for both the geographic fixed effects, state or metropolitan, η_{s_i}, and the year fixed effects, δ_t. The inclusion of these fixed effects rules out several concerning omitted variable bias. The year fixed effects account for changes that occurred at national level throughout the period of analysis, for instance access to mortgages or interest rates. Meanwhile, the geographic fixed effects account for time invariant characteristics of that geography.

Table 1 shows the estimated coefficients obtained from the state level regression with the dependent variable being the coresidence status and marital status. The standard errors are clustered at the state level. The analysis is for the 2000-2019 period.[8] The first two columns of the table use coresident status as dependent variable, the second two use marital status.[9] For each dependent variable, the first column shows the estimates obtained using OLS, while the second column shows the ones obtained using the instrument.

The IV estimates suggest that a unit increase the house price index increases the probability of being a coresidor by 1.67 percentage points. Given that the standard deviation of the house price index is 1.26, this implies that a one standard deviation increase in house prices is linked to a 2.1 percentage points increase in the probability of being a coresidor. The OLS coefficients are close to 0 and not significant. As discussed above, this might be due to the relationship between labor market and migration pattern and house prices, that bias downwards the estimate. Meanwhile, an increase in one standard deviation of house prices is linked to a decrease in around 1.4 percentage points in the probability of being married or cohabiting. Also in this case, the coefficient obtained with the OLS is closer to 0 than the the IV.

Table 2 shows the estimated coefficients obtained from the metropolitan level regression. Again, the first two columns of the table use coresident status as dependent variable, the second two columns never married status. The analysis is done for the 2005-2019 period.[10]

The results obtained are consistent with the ones obtained at the state level. Given a standard deviation of the house price index of 1.13, the IV estimates suggest that a one standard deviation increase in house prices is linked to a 2 percentage points increase in the probability of being a coresidor, and a decline of 3.4 percentage points in the probability of being married or cohabiting.

[8] The American Community Survey provides yearly data from 2000.

[9] For first stage estimates refer to Table B4.

[10] This is due to the changes in the metropolitan definitions in the American Community Survey.

Table 1: State Level Regression Estimates

	Coresidence		Marriage	
	(1)	(2)	(3)	(4)
	OLS	IV	OLS	IV
Lagged HPI	0.00263	0.0167***	-0.00446*	-0.0114**
	(0.419)	(0.002)	(0.085)	(0.013)
State FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Ind. Controls	Yes	Yes	Yes	Yes
State Controls	Yes	Yes	Yes	Yes
F-Statistics		20.32		20.32
Observations	3645507	3614416	3645507	3614416

Notes: *Table shows the estimated coefficients obtained from the state level regression. The errors are clustered at the state level. p-value in parentheses, * $p < 0.10$, ** $p < 0.10$, *** $p < 0.10$. The dependent variable is the coresidence status in columns 1 and 2, and marital status in columns 3 and 4. For each dependent variable, the second column estimates are obtained by instrumenting the lagged house price index. Marriage includes cohabitation, i.e., living with a partner. The sample is composed of individuals between the ages of 23 and 29.*

This empirical exercise has shown that house prices increase the probability of young adults of coresiding with one's parents and decrease the one of being married or cohabiting. In Appendix B, I run a series of robustness checks on the main specification. First, I show that the results on coresidence are robust to enlarging the sample to include all adults between the ages of 23 and 49. Meanwhile, the relationship between house prices and marriage on the entire population holds at the metropolitan level but not at the state level (Table B1). Second, I show that the results are robust and have similar magnitude when using different measures of state level house prices, such as using house prices from Zillow and current house prices (Table B2). Finally, I run the analysis separately for non-college and college educated, showing that the effects of house prices are slightly larger among non-college educated (Table B3).

3 Stylized Model: Mechanism Linking House Prices, Coresidence, and Marriage

The previous section shows that higher house prices increase the likelihood for young adults of living with their parents and reduce the one of being married or cohabiting with one's partner. In this section, I present a stylized model that can help us to understand these

Table 2: Metropolitan Level Regression Estimates

	Coresidence		Marriage	
	(1)	(2)	(3)	(4)
	OLS	IV	OLS	IV
Lagged HPI	0.00105	0.0174**	-0.00934***	-0.0303***
	(0.789)	(0.036)	(0.005)	(0.001)
Metro FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Ind. Controls	Yes	Yes	Yes	Yes
Metro Controls	Yes	Yes	Yes	Yes
F-Statistics		14.51		14.51
Observations	1645362	1375108	1645362	1375108

Notes: *Table shows the estimated coefficients obtained from the metropolitan level regression. The errors are clustered at the state level. p-value in parentheses, * $p < 0.10$, ** $p < 0.10$, *** $p < 0.10$. The dependent variable is the coresidence status in columns 1 and 2, and marital status in columns 3 and 4. For each dependent variable, the second column estimates are obtained by instrumenting the lagged house price index. Marriage includes cohabitation, i.e., living with a partner. The sample is composed of individuals between the ages of 23 and 29.*

empirical findings and highlight the key that young adults face in the full-blown quantitative model in the next section.

In this model, agents live only one period. They differ in gender and labor market productivity (wage) and choose coresidence and marriage to maximize their utility. First, they can choose whether to coreside with their parents or live independently. After the coresidence decision, they meet a potential partner of the opposite gender in the marriage market and decide whether to marry or not. While coresidents do not incur any housing cost, singles who live independently and those who marry must pay rent. Marriage allows individuals to pool their resources and share a single house.

If they coreside, they cannot marry, a simplifying assumption that will be relaxed in the quantitative model. This highlights how coresidence reduces marriage prospects, creating an endogenous gender balance in the marriage market. Lower prospects can result either from difficulty meeting singles due to lack of independence or lower chances of marriage due to parental interference.

First, I show that taking coresidence decisions as given in the second stage of the model, higher house prices lead to increases in marriage. This results from the gains from economies of scale and individuals becoming less picky about partners to be able to afford housing. Then, I show that higher house prices increase the share of people living with their parents, making marriage less attractive. This effect is stronger for individuals with lower wages. Finally, by combining the two effects, I show that the impact of house prices on marriage is ambiguous. A higher house price can lead to more marriages if the economies-of-scale effect dominates. On the other hand, the coresidence effect can also dominate, resulting in fewer individuals participating in the marriage market and fewer marriages.

Setup. Individuals are born with a predetermined gender $g \in \{m, f\}$ and wage w. The measure of the population is 1, and it is divided equally across genders. Individuals live for one period, and make choices on consumption c, housing h, and marriage. The period is divided in two sub-periods. In the first sub-period, agents make their coresidence choice, $h \in \{0, 1\}$, with $h = 0$ being coresidence, and $h = 1$ living independently. In the second sub-period, all agents meet randomly in a marriage market. However, only agents who chose to live independently can marry.

In equilibrium, the housing choices of agents of gender g are consistent with the housing choices of the opposite gender. For instance, if all males choose to coreside, females will take this into consideration, and all might choose to coreside also. I solve for the equilibrium of the model backwards. First, I show the utility of agents in the last sub-period. Then, I discuss the potential marriages. These are the marriages that would occur, assuming no parental coresidence. Finally, I solve the coresidence choice.

End of Period Utility. In the end of the period agents can be in three different types of households: single and coresident, single and independent, or married. The household type determines the total resources they enjoy. Let w_g be the wage of gender $g \in \{m, f\}$ and ρ the house price, then the households total resources are given by:

$$\begin{cases} w_g & \text{Single coresident,} \\ w_g - \rho & \text{Single independent,} \\ w_m + w_f - \rho & \text{Married.} \end{cases} \tag{2}$$

Notice that a married household has two individuals who live in only one house.

The utility of individuals is given by $\log(c) + \phi h$, where ϕ is the utility premium from housing. As married households have two individuals, the total resources need to be divided by an amount η. I set $\eta \in (1, 2)$ to capture the economies of scale. The utility of individuals in the last sub-period is given by:

$$\begin{cases} U^C(w_g) = \log(w_g) & \text{Single coresident,} \\ U^I(w_g, \rho) = \log(w_g - \rho) + \phi & \text{Single independent,} \\ U^M(w_m, w_f, \rho) = \log((w_m + w_f - \rho)/\eta) + \phi & \text{Married.} \end{cases} \tag{3}$$

Notice that I assume that the utility obtained from housing does not depend on marital status. This simplifies the analysis, without affecting the main results.

Potential Marriages. A male with wage w_m will marry a female with wage w_f if:

$$U^M(w_m, w_f, \rho) \geq U^I(w_g, \rho), \tag{4}$$

for $g \in \{m, f\}$. Then, given equation (2), for a given male, we can find a female with wage w_f^* that makes him indifferent between marrying or not, i.e. $w_f^*(w_m) = (w_m - \rho)(\eta - 1)$. I call this equation the Male-Indifference curve. Symmetrically, we obtain the Female-Indifference curve as $w_m^*(w_f) = (w_f - \rho)(\eta - 1)$.

In Figure 4, I plot the two indifference curves to obtain an area of potential matches. The Y-axis is the female wage, and the X-axis the male one. The coloured area shows the possible matches, given the imposed limits on wages. The red area represents potential marriages. The blue area underneath the dashed green line, labelled Male-Indifference, shows meetings that do not result in a marriage when the males do not want to marry. This happens as the relative wage, w_m/w_f is too high, and males do not gain enough by sharing their resources. A symmetric situation happens in the meetings in the blue area above the green solid line, labelled Female-Indifference.

Notice that η regulates the steepness of the two indifference curves. In the limit case of $\eta = 2$, the two curves are parallel, separated by ρ. In this case, the gains of marriage come only from sharing the housing cost. Hence, if $\eta = 2$ and $\rho = 0$, the indifference curves would overlap, and agents would only marry the person with the same wage as themselves. As η falls, the gains from marriage increase due to larger economies of scale. Hence, agents would marry also agents with lower wages. Finally, for the limit case of $\eta = 1$, agents would marry anyone, i.e. the red area would cover the entire area, as marriage has no cost.

Result 1. Given an $\eta \in (1, 2)$, as the house price ρ increases, the potential marriages increase.

Figure 4: Meetings and Potential Marriages

Notes: *The figure shows the matches in the marriage market. The red area are the matches that are Potential Marriages. The simulation uses the following parameters:* $w \sim U[0, 10], \rho = 1.95, \eta = 1.7$ *and* $\phi = 1.04$.

In Figure 4, as house prices increase, the Male-Indifference curve becomes flatter, while the Female-Indifference curve becomes steeper. This increases the red area in the graph. Figure 5 shows the share of potentially married individuals, i.e. the relative share of the red area, across house prices. The economic rationale behind Result 1 is that, as housing becomes more expensive, the economies of scale motive for marriage become stronger. This mechanism is the main one that has been highlighted in the literature (Salcedo et al., 2012).

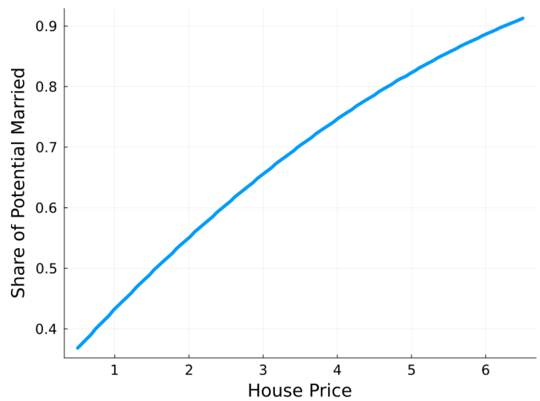
Coresidence Choice. Having analyzed the marriage market, it is now possible to solve the coresidence choice. Agents choose to live independently if the expected utility of living independently is higher than the utility of coresiding:

$$\mathbb{E}[U(w_g, \rho)] > U^C(w_g), \text{ for } g \in \{m, f\}. \tag{5}$$

The expectation is due to the uncertainty in the marriage market, which is related to not knowing the wage of the potential partner, and not knowing if the partner is coresiding or not. The relationship between these utilities also depend on the utility premium from housing, ϕ. A higher value for ϕ increases the gains from living independently.

Let the indicator function $\mathbb{1}^{\mu}(w_m, w_f)$ be equal to one if the match between a male with

Figure 5: Potential Marriages Shares



Notes: *The figure shows the share of potential marriages across house prices. The simulation uses the following parameters:* $w \sim U[0, 10], \rho \in (0.5, 6.5), \eta = 1.7$ *and* $\phi = 1.04$.

wage w_m and a female with wage w_f results in a marriage, i.e. the match is in the red area of Figure 4. Furthermore, let $\mathbb{1}^h(w_m, w_f)$ be equal to one if either of the agents have decided to coreside. Then, for a male with wage w_m, the expected utility of living independently is given by:

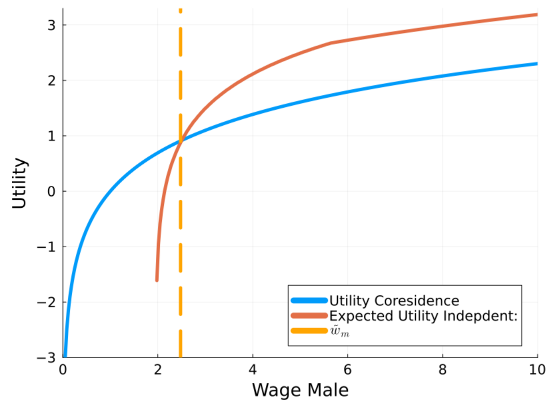
$$\mathbb{E}[U(w_m, \rho)] = \int \pi(w_f) \times \Big[\big(1 - \mathbb{1}^\mu(w_m, w_f)\big)U^I(w_m, \rho) + \\ \mathbb{1}^\mu(w_m, w_f) \times \Big(\mathbb{1}^h(w_m, w_f)U^I(w_m, \rho) + \\ \big(1 - \mathbb{1}^h(w_m, w_f)\big)U^M(w_m, w_f, \rho)\Big)\Big] dw_f,$$

where $\pi(w_f)$ is the probability of meeting a person with wage w_f. The first line accounts for meetings that do not transform into marriages because at least one of the agents do not want to marry. The second line accounts for meetings that do not transform into marriages because at least one of the agent is coresiding. Finally, the last row accounts for meetings that do transform into marriages.

Two important remarks on the expected utility of living independently. First, it is computed taking into consideration the coresidence choice of agents of the opposite gender. If all female agents choose to coreside, the indicator function $\mathbb{1}^h(w_m, w_f)$ is 1 $\forall w_f$. Hence the expected utility of living independently for a male is given by the end of period utility of living independently, $U^I(w_m, \rho)$. Second, in equilibrium, the expected utility is computed with *correct* coresidence choices of genders.

Result 2. Given a house price ρ, an economy of scale parameter $\eta \in (1, 2)$, and a utility premium from housing $\phi > 0$, there exists a threshold $\tilde{w}$ such that agents with $w < \tilde{w}$

Figure 6: Utilities of Living Independently and Coresiding



Notes: *The figure shows the utility from coresiding, in blue, and the expected utility of living independently, in orange. The dashed yellow line shows the threshold wage $\tilde{w}_m$, which sets apart agents between coresiding and living independent. The simulation uses the following parameters: $w \sim U[0, 10], \rho = 1.95, \eta = 1.7$ and $\phi = 1.04$.*

coreside, while agents with $w > \tilde{w}$ live independently.

This holds because of two reasons. First, agents who have a wage below the house price will always coreside. They cannot afford to live independently, and, in the marriage market, they risk meeting a person with a wage such that $w_m + w_f < \rho$. Hence, even as a couple they would not be able to afford the housing cost. Second, for agents with wages above the house price, the reduction in utility from paying the house price ρ is less than the gains in utility from living independently.[11] Figure 6 shows the expected utility of living independently for a given house price and the utility of coresiding along the wage distribution of males. The threshold $\tilde{w}_m$ is demarcated by the yellow dashed line in the figure. There is a symmetric threshold for females, $\tilde{w}_f$.

Result 3. Given an economies of scale parameter $\eta \in (1, 2)$ and a utility premium from housing $\phi > 0$, as the house price ρ increases, the threshold $\tilde{w}_g$ increases.

This result is due to the fact that the utility of coresiding does not depend on house prices, while the utility of living independently and the utility of being married do. More specifically, these two utilities decrease with the house price. This can be seen from the partial derivatives with respect to the house price:

$$\partial U^I(w_m, \rho)/\partial \rho = -1/(w_m - \rho), \tag{6}$$

[11] $U^I(w_m, \rho) - U^C(w_m) > 0$ and $U^I(w_m, w_f, \rho) - U^C(w_g)$ are increasing and monotonic in w_m.

and

$$\partial U^M(w_m, w_f, \rho)/\partial \rho = -1/(w_m + w_f - \rho), \tag{7}$$

with $w_m > \rho$. Meanwhile, the utility of coresiding does not depend on the house price.

This result explains why the share of coresidence increases with house prices. Furthermore, it helps in explaining the higher increase in coresidence for non-college educated individuals. When $w > \rho$, the derivative of the utility of living independently is increasingly negative the closer the wage is to the house price. Hence, non-college educated individuals, who tend to have lower wages, are more responsive to house prices changes.

Equilibrium Marriage Share. Combing the Result 1 and Result 3, we obtain the key trade-off in the model.

Result 4. Given an economy of scale parameter $\eta \in (1, 2)$ and a utility premium from housing $\phi > 0$, as the house price ρ increases, the effect on the share of married individuals is ambiguous.

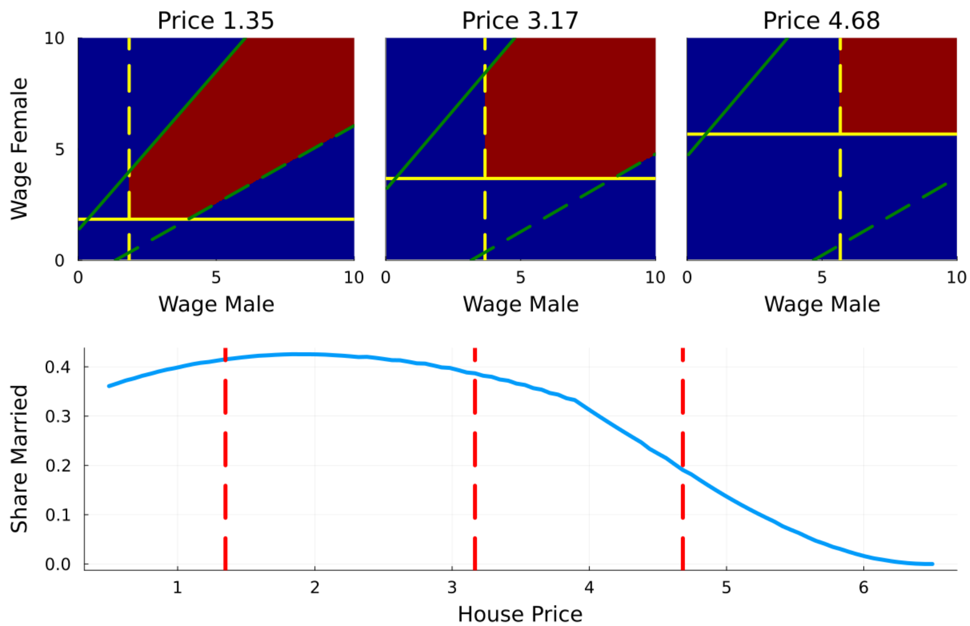
This result is due to the fact that the increase in potential marriages is counteracted by the increase in coresidence. A higher house price increases the share of people that coreside, lowering the actual share of married individuals. However, the higher house price increases the gains from marriage, increasing the share of marriage among those who do not coreside.

This trade-off is shown in Figure 7. In the upper panel, the vertical and horizontal yellow lines indicate the coresidence decisions. Individuals whose wages are below these thresholds do not participate in the marriage market. As house prices increase, the threshold shifts to the right for males and upward for females, resulting in a smaller share of individuals in the marriage market. On the other hand, as house prices increase, marriage becomes more attractive for those who participate, i.e., the area marked by green lines expands (as in Figure 4). The lower panel reports the equilibrium share of individuals who end up marrying. The share first increases but then starts declining, first slowly and then much faster.[12]

This simple model highlights the bi-directionality of the relationship between parental coresidence and the marriage market. On the one hand, a higher share of coresidents reduces the share of people in the marriage market mechanically. On the other hand, worse marriage

[12]The kink in the marriage share is due to the fact that, above a certain house price, only the coresidence threshold matters for marriage. We can see this in the third match graph, where only the yellow lines determine the matches that result in marriage.

Figure 7: Potential Marriages Shares



Notes: *The top panel of the figure shows the share of marriages across house prices. The bottom panel shows the matches and their outcome across three different prices. The simulation uses the following parameters:* $w \sim U[0, 10], \rho \in (0.5, 6.5), \eta = 1.7$ *and* $\phi = 1.04$.

market prospects, which can be interpreted as a lower expected utility of living independently, reduce the desire to leave the parents' house. Hence, an essential conclusion of this framework is that coresidence can be seen as insurance against unfavorable marriage prospects. This result is closely linked to Kaplan (2012) where parental coresidence acts as insurance against labor market uncertainty.

4 Quantitative Model

The stylized model in the previous section purposefully focuses on one factor that affects coresidence and marriage decisions and abstracts from other potential forces. In this section, I develop a rich quantitative model that bridges models of household formation (see, among others, Greenwood et al., 2016, Santos and Weiss, 2016, Ciscato, 2019) with macroeconomic models of housing markets (see, among others, Floetotto et al., 2016, Sommer and Sullivan, 2018, Kaas et al., 2020).

The model features four agents: individuals, a construction firm, a rental agency sector, and the government. Individuals differ in their predetermined education level (college and non-college), go through their life-cycle, and make marriage and housing decisions. They also make standard life-cycle decisions on how much to consume and save. Household decisions create a demand for housing, and this demand is matched by the housing supply provided by construction firms and rental agencies. Single individuals meet in a marriage market, and marriage and divorce decisions reflect expectations about what other individuals do. In equilibrium, these expectations are consistent with individual choices. The housing market equilibrium determines house prices and quantities. Finally, a government collects taxes to finance government expenditures and run housing policies.

Along the life cycle, individuals face idiosyncratic productivity shocks to their wages. Each period, after observing a new realization of their productivity, single and married households make their choices. Single households choose next-period assets and housing and then meet a potential partner in the marriage market. The potential couple draws an idiosyncratic love shock, and decide whether to marry. If they do, they start the next period as a newly married household. They combine their assets and housing stock. Otherwise, they remain as two single households. Married households decide on the wife's labor force participation, savings, and housing. After their decisions, married households observe a new realization of their love shock. With this information, any individual in the couple can decide to divorce. If they divorce, the assets and house have to be split. The splitting of a house involves some uncertainty: one of the partners might end up with the house, or the home might be liquidated. After the divorce, each party starts the next period as a single household.

Regarding housing, households can choose to be homeowners, renters, or, if they are single, coresidents. Coresidents obtain a fixed housing utility and do not incur any housing costs. On the other hand, they have lower marriage opportunities. Homeowners and renters can choose the size of the housing from a discrete set, which determines their utility from housing and their housing costs. As highlighted in the stylized framework, allowing individuals to live with their parents and save on housing costs is a novel model feature. Coresidence enables individuals not to pay any housing costs and accumulate wealth, which can be helpful to insure against income volatility and pay the down payment to purchase a house with a mortgage. However, coresiding restricts the housing choices compared to living as an independent single and reduces the opportunity of getting married.

Note that while in the stylized model, the only benefit of marriage was the sharing of resources (economies of scale), here, marriage helps couples to ensure against idiosyncratic shocks and the accumulation of assets. On the other hand, income fluctuations and love shocks also induce divorces.

The government can alter the housing demand by implementing policies that reduce housing costs or relax the mortgage constraints. The change in demand is matched, in equilibrium, by a shift in housing supplied by the construction firm. This alters the equilibrium house prices. As discussed in the previous section, a higher house price has two effects. On the one hand, it can increase the share of coresidents, as housing costs are higher. On the other hand, it increases the economies of scale motive to marry. However, in this framework, house prices also interact with divorce choices, affecting the division of assets and housing.

Finally, exogenous changes in income trajectory, income uncertainty, and interest and mortgage rates affect the living arrangements and marital choices. Higher volatility can postpone moving out of the parent's house and marriage. Larger differences in income between college and non-college-educated individuals can increase inequality and decrease the marrying appeal of the former group. Decreases in the gender wage gap can reduce the willingness of women to marry with a low match.

4.1 Individuals

Demography. Individuals live for J periods, with their age being $j = [j_0, J]$. Individuals enter the model with a predetermined gender and education. The gender can either be male or female, $g \in \{m, f\}$. Education can either be not-university-educated, or university-educated, $e \in \{n, u\}$. These are fixed throughout their entire life.

Throughout their life-cycle, individuals earn income from wages, w, and the return on assets, ra. Individuals make choices on marital status, either single or married $\mu = \{S, M\}$, forming different types of households. A household can either be composed of a single person, or by a married couple. All households make choices on next-period assets and housing. Married households also choose female labor force participation.

Furthermore, marital status affects the housing choice that households can make. Single and married households can choose to be renters or owners of a house. Single households can also choose to live with their parents, who are not modeled. These housing choices determine the housing status s of the household, which can be either coresident, renter, or owner, $s \in \{C, R, O\}$. Finally, for the sake of clarity, households that do not coreside are labeled as independent, while the ones that do are labeled as coresidents.

Preferences. Households maximize expected lifetime utility. Their period utility depends on their economic and marital choices. For the former, households have preferences over consumption c and housing size q according to a non-separable utility function $u(c, q; s, \mu, k)$. This utility function also depends on the housing status s, the marital status, and the number of children k, as these affect the size of the household and hence the economies of scale.

The period utility of married households also depends on their marriage match quality, $\mathbf{M}(e_m, e_f)$, their love, λ, and the female labor supply $P_f \in \{0, 1\}$. If the married female works, the household suffers a utility cost that depends on the education of the female ϕ_{e_f}.

The total household utility $U()$ is given by:

$$U() = u(c, q; s, \mu, k) + \mathbb{1}_{\mu=M}\left[\mathbf{M}(e_m, e_f) + \lambda - \mathbb{1}_{P_f>0}\phi_{e_f}\right]. \tag{8}$$

The indicator function $\mathbb{1}_{\mu=M}$ takes the value of one when the household is married. The indicator function $\mathbb{1}_{P_f>0}$ takes the value of one when the female labor force participation is positive.

Labor Income. Single individuals and married males work every period. Married females can choose whether to participate in the labor market. Labor income depends on a deterministic component, $f_w()$, and on a persistent shock with innovation denoted by z:

$$w = f_w(g, j, e)z. \tag{9}$$

The deterministic component depends on gender, age, and education. The persistent shock follows an AR(1) process:

$$\ln z' = \ln z + \varepsilon_z, \text{ and } \ln z_0 \sim N(0, \sigma^2_{0,g,e}) \tag{10}$$

with ε_z being the innovation shock. These shocks are taken from a Normal distribution where the variance depends on the gender and education of the individual: $\varepsilon_z \sim N(0, \sigma^2_{g,e})$. The initial dispersion in wages follows a Normal distribution where the variance depends also on gender and education. I follow Low et al. (2018), and assume that the labor income volatility of married individuals is not correlated. The endogenous household formation allows the model to match the correlation of earnings between husband and wives.

Housing. Housing involves two decisions. The first is the housing status, the second is the housing size. The housing status of households can be either coresiders, renter, or owner $s \in \{C, R, O\}$. The second decision is the size of the housing. I assume that there is a discrete set of housing sizes $q \in \mathcal{Q} = \{q_1, ..., q_{\bar{h}}\}$, where higher subscript implies a house with a larger size.[13] Households that choose to coreside, live in a house of size $q = q_c < q_1$. Renters and homeowners, instead can choose the housing size. Renters can choose housing $q = \{q_1, ..., q_{\bar{r}}\}$, while homeowners can choose $q = \{q_1, ..., q_{\bar{h}}\}$, with $\bar{r} < \bar{h}$.

The restrictions on the housing choices of coresidents, renters, and owners have several implications. First, there is a minimum housing size to live independently, a constraint that is common in the literature (Floetotto et al., 2016, Piazzesi and Schneider, 2016, Gervais, 2002). Second, coresidents obtain a utility from housing that is lower than the smallest available independent house. This is an implicit cost of being a coresident. Third, homeowners have a larger housing size choice set than renters. Hence, while renters and owners who choose the same housing size obtain the same utility, ownership is the only way to obtain the largest housing unit, creating an incentive for ownership.

Regarding housing costs, coresidence is free, yet only single households can choose it. Renters pay only rent $\rho(q) \times q$, where the rental rate $\rho(q)$ depends on their chosen house size. These rental rates will be determined by rental companies who buy houses from construction companies and rent them to households. Homeowners pay $q \times p$, the house size multiplied by unit house price p. The house price and the rental rate are set in the housing market equilibrium. Furthermore, buying and selling a house imply proportional transaction costs on the house value, denoted t^b and t^s. Finally, every period homeowners have to pay an essential maintenance cost, δqp, which counteracts the period depreciation rate δ.

Assets and Mortgages. Households can save by holding a safe asset a that pays an interest rate r. The only way for a household to borrow is through a mortgage to purchase their house, which has an exogenous interest rate r^m and is subject to a down payment constraint θ. This means that renters and coresidents cannot have negative assets. Hence, the assets constraint is given by:

$$a' \geq \begin{cases} -(1-\theta)qp & \text{if } s = \{O\} \\ 0 & \text{if } s = \{C, R\} \end{cases} \tag{11}$$

where a' is the next period asset choice.

Marriage, Match Quality, and Love. The marital status of individuals can be single

[13] A larger subscript can also be interpreted as a house with a higher quality, or a more appealing house.

or married, $\mu \in \{S, M\}$. Every period, single individuals meet a potential partner of the opposite gender and of the same age in a marriage market. The couple observes the match compatibility $\mathbf{M}(e_m, e_f)$ and the first realization of the love shock λ. These capture the non-economic benefits for marriage.

The first depends on the education similarity and is given by the following functional form:

$$\mathbf{M}(e_m, e_f) = \nu_0(1 - e_m)(1 - e_f) + \nu_1(e_m e_f). \tag{12}$$

If the potential partners have the same education, their match quality is either ν_0 or ν_1, for non-university and university-educated respectively. Otherwise, it is 0.

The first realization of love comes from a distribution, $\lambda \sim F_\lambda(\bar{\lambda}, \sigma_\lambda^2)$. Once married, love evolves according to an AR(1) process:

$$\lambda' = (1 - \rho_\lambda)\bar{\lambda} + \rho_\lambda \lambda + \varepsilon_\lambda, \tag{13}$$

with $\varepsilon_\lambda \sim N(0, \sigma_\lambda^2(1 - \rho_\lambda^2))$. Given the persistency of the process ρ_λ, if the initial love shock is low, the individuals might not marry, and wait to obtain a better initial love realization

Additionally, each individual observes the education, the assets, the productivity, and the housing of the potential partner. Furthermore, they both know their distribution among singles. Both individuals use all of this information to choose whether to get married or not. If both individuals want to marry, and both chose to live independently, then they will marry.

When singles meet other singles in the marriage market and want to get married, if either one is coresiding, they marry with a probability $\pi_{marry} < 1$. Hence, coresidence lowers the marriage opportunities of coresidents. Furthermore, it also creates a negative externality by lowering the marriage opportunities of the other individuals who meet coresidents. While in the stylized model, π_{marry} was set to 0, it will be estimated here, together with other model parameters. However, the interpretation is similar: it can be thought of as lower marriage chances after a single individual matches with another single or as lower chances of meeting other singles.

If two singles get married, they start the following period as a newly-married household and pool their assets and housing stock. I assume that they have to live in the same house and consolidate their housing by: i) living in the largest house if both are owners (and selling the other house with the transaction costs), ii) rent the largest rental unit if both are renters, and iii) rent the smallest rental unit in the market if both are coresidents. In other cases, the couple uses the house owned or rented by one of the parties.

Considering this aggregation of housing, the start-of-next-period housing status of the newly formed household is given by:

$$s' = \begin{cases} O & \text{if } \exists s_g = O \\ R & \text{else.} \end{cases} \tag{14}$$

This implies that if one of the partners is an owner, the couple will live in the owned house. Otherwise, they will rent.

Meanwhile, the housing size of the couple is given by:

$$q' = \begin{cases} Q_1 & \text{if } s_m = s_f = C \\ \max\{q_m, q_f\} & \text{if } s_m = s_f \neq C \\ q_g & \text{if } s_g = O \text{ and } s_{-g} \neq O \\ q_g & \text{if } s_g = R \text{ and } s_{-g} = C \end{cases} \tag{15}$$

This implies that if both partners are coresidents, they will live in the smallest house. If both are renters or both are owners, they will live in the largest house. If one is an owner, and the other partner, $-g$, is not, they will live in the owned house. Finally, if one is a renter and the other a coresident, they will live in the rented house.

The aggregation of assets is given by:

$$a' = \begin{cases} \min\{q_m, q_f\} \times p \times (1 - t^s) + a_m + a_f & \text{if } s_m = s_f = O \\ a_m + a_f & \text{else.} \end{cases} \tag{16}$$

This states that assets are aggregated, and in the case in which both partners are owners, they have to sell the house paying the transaction costs t^s.

Divorce. Individuals who started the period in married households observe the realization of their love shock, λ'. Using this information, and the new realizations of the income shocks, both individuals in the marriage unilaterally choose whether to divorce. If they get divorced, they pay a utility divorce cost κ_d, divide assets, and form two separate single households.

The risk of divorce and the division of assets affects the choices of households as it can lead to a drop in consumption due to the reduction in income caused by costs and forgone returns of economies of scale.

The division of household assets and housing depends on the current holdings. If the household does not own any housing, the assets are divided equally between the two.[14] If it owns a house and a mortgage, the house has to be liquidated paying the transaction costs, and the assets are split in two. If it owns a house without a mortgage, with probability $\pi_m < 0.5$ the house stays with the male, with probability $\pi_f < 0.5$ it stays with the female, and with probability $\pi_{liq} = 1 - \pi_m - \pi_f$ the house needs to be sold. The assets are split equally.[15] Finally, any spouse who loses the owned house can choose to start the next period as a renter or coresident.

Children. There is a deterministic function that links household age, gender, education and marital status to the number of children:

$$k = \begin{cases} f_k^S(j, g, e) & \text{if single,} \\ f_k^M(j, e_m, e_f) & \text{if married.} \end{cases} \tag{17}$$

Children are costly and do not increase utility. Each child has cost that is related to labor income κ_k. Furthermore, children affect the size of the household and hence the economies of scale in the utility function.

4.2 Construction Firm

There exists a construction firm that supplies housing units at price p. These house units can be aggregated to form houses of size $q \in \mathcal{Q} = \{q_1, ..., q_{\bar{h}}\}$. I assume that the construction firm has a convex cost function for producing of new housing units I:

$$K(I) = \frac{\varsigma_1 I^{1+\frac{1}{\varsigma_2}}}{1 + \frac{1}{\varsigma_2}}, \tag{18}$$

[14] This is a standard assumption in models that abstract from housing such as Fernández and Wong (2017) and Low et al. (2018).

[15] This is similar to Chang (2023). The division of assets, housing, and mortgage is done in this way due to the following considerations. First, the house cannot be split among the spouses. The key idea is that houses are not divisible assets (Piazzesi and Schneider, 2016) and mortgages are linked to the house. Second, the a priori division of housing is uncertain and depends on the divorce regime (Lafortune and Low, 2023, Doepke and Tertilt, 2016). Finally, the courts can impose the selling of the house.

where the term ς_1 is a scaling factor, while the term ς_2 represents the housing supply elasticity.[16]

The construction firm maximizes profits by choosing new housing units I:

$$\max pI - K(I). \tag{19}$$

From the first order condition, we obtain the housing supply relationship:

$$p = \varsigma_1 I^{\frac{1}{\varsigma_2}}. \tag{20}$$

The supply elasticity ς_2 is a determinant variable in the responsiveness of house prices and quantities to changes in housing demand due to government policies.

4.3 Rental Agencies

There exist rental agencies that purchase housing units from the construction sector, bundle them into houses of the different sizes, $q \in \mathcal{Q} = \{q_1, ..., q_{\bar{r}}\}$, and provide them to households for rent. These firms operate in a competitive market (Kaas et al., 2020). More specifically, to provide a house of size q, the rental agency firms purchase q housing units at price p and rent it to household at rental rate $\rho(q)$. For each housing unit, the rental agencies firms faces the depreciation costs δ, the cost of capital r, and monitoring cost that depends on the size of the house, $\kappa_m(q)$.

Considering this, the discounted value of a housing unit that is rented in a house of size q is given by:

$$V(q) = [\rho(q) - \kappa_m(q) - \delta p + V(q)]/(1 + r),$$

where the first term represent the revenue from renting, the second and third, the costs of monitoring and maintenance. The last term is the value of the house next period, which given the essential maintenance assumption, is the same as the current value. From the

[16] The convex cost function is a reduced way to capture the scarcity of land that can be built, inputs, and regulations. Davis and Heathcote (2005) and Floetotto et al. (2016) formulate this more explicitly. The construction firm buys land for development L at price 1, and sells it immediately for new housing units at price p. The construction firm has a decreasing return in production, $I = \varsigma_3 L^{\varsigma_4}$, as every period more of the available land is developed, and hence developing additional land becomes more costly. The construction firm maximizes profits, $\max_L p\varsigma_3 L^{\varsigma_4} - L$

zero-profit condition, the value of each housing unit has to be equal to the house price p. This leads to the following relationship between house prices p and rental rates ρ:

$$\rho(q) = p(\delta + r) + \kappa_m(q). \tag{21}$$

As a result, for a given depreciation and interest rate, the rent to price ratio for a specific house size is determined by the monitoring cost, $\kappa_m(q)$.

4.4 Government

Finally, the government collects taxes from household income and properties to finance government spending G that does not generate any utility for households and to run housing policies that cost P. Taxable income $\tilde{y}$ is obtained by the sum of the household wages and the returns on assets. Income taxes are computed using the progressive tax function $T(\tilde{y}, \mu)$, with $\tilde{y} \times T(\tilde{y}, \mu)$ representing total income tax liability. The tax function depends on the marital status of the household. Meanwhile, homeowners have to pay property taxes that depend on the value of their owned house: $\tau^h qp$.

4.5 Value Functions and Household Decisions

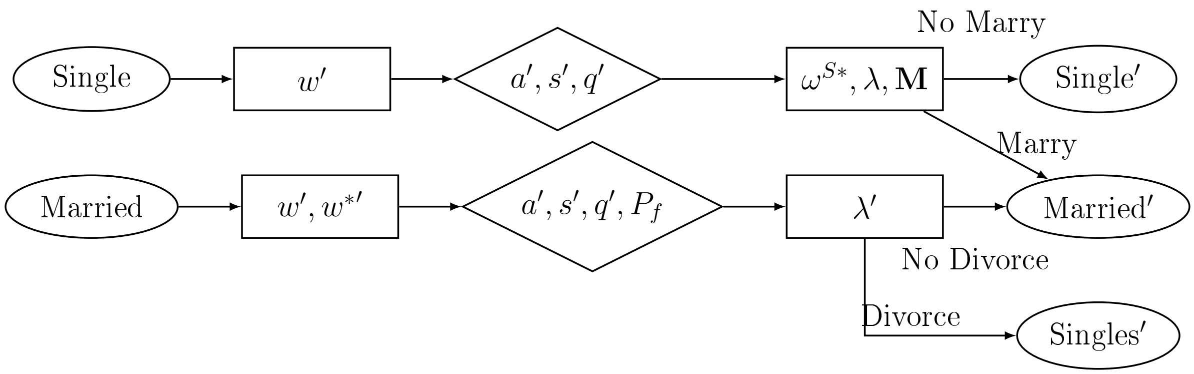
Let $\omega_g^S = (g, e, j, w, a, s, q, \mu = S) \in \Omega_g^S$ represent the starting state variables for a single household, with Ω_g^S being the corresponding state-space. Let $\omega^M = (e_m, e_f, j, w_m, w_f, a, s, q, \mu = M, \lambda) \in \Omega^M$ be the starting state variables for a married household, and Ω^M the corresponding state-space. Below I use the suffix $'$ to represent the next-period variable, and the suffix * to denote the partner's variable.

Timing. Each period is divided into 3 substages. First, households observe shocks to labor income, ε_z. Second, household level choices are made. For single households these are next period assets and housing. Married household also choose female labor force participation. The third and final substage is the decision on marriage and divorce.

Single households meet each other in the marriage market and observe the partner's state space, ω^{S*} and the love shock λ. They decide whether to marry. If either of them is a coresident, they marry only with probability π_{marry}. Two singles who decide to get married join their assets and housing as detailed above.

Similarly, married households observe a new realization of the love shock λ' and considering this, each party decides whether to divorce. If they divorce, the married household splits into two single households. Assets and housing are separated as stated above. Any spouse who loses the owned house starts the next period as a renter or coresident. Figure 8 shows the timeline of events.

Figure 8: Timeline of Events



Single Households. Considering single households of age $j < J$. Singles meet other single individuals of the same age and opposite gender. They observe the state-space of the potential partner and the love realization λ. Then, both individuals choose whether to get married. They marry if the value of being married is higher than the value of being single:

$$V(e_m, e_f, j, w_m, w_f, \tilde{a}, \tilde{s}, \tilde{q}, \mu = M, \lambda) \geq V(g, e, j, w, a, s, q, \mu = S), \forall g \in \{m, f\}, \tag{22}$$

with $\tilde{a}, \tilde{s}, \tilde{q}$ obtained as the sum aggregation of assets and housing across couples as defined in equations (14),(15),(16).

Let $\mathbb{1}^h(\omega_g^S, \omega_{g*}^S)$ be 1 if either partner is coresiding. Furthermore, let $\mathbb{1}^\mu(\omega_g^S, \omega_{g*}^S, \lambda)$ be 1 if both want to marry, i.e., equation (22) holds. Then value function for a single household that starts the period with state variables ω_g^S can be written as:

$$
\begin{aligned}
V(\omega_g^S) = \max_{a',s',q'} & U(\omega_g^S) \\
& + \beta\, \mathbb{E}\Bigg[\int_{\Omega_{g*}^S}\int_{\Lambda}\Big[\mathbb{1}^{\mu}()\Big(1-\mathbb{1}^{h}()\Big) \times V(\omega^{M\prime}) \\
& + \mathbb{1}^{\mu}()\mathbb{1}^{h}()\pi_{marry} \times V(\omega^{M\prime}) \\
& + \mathbb{1}^{\mu}()\mathbb{1}^{h}()\Big(1-\pi_{marry}\Big) \times V(\omega_g^{S\prime}) \\
& + \Big(1-\mathbb{1}^{\mu}()\Big) \times V(\omega_g^{S\prime})\Big] dF_{\lambda}(\lambda) d\hat{\mathcal{S}}\Bigg].
\end{aligned} \tag{23}
$$

The first line represents the period utility while the following ones the expected value of next period utility. The expectation is over the wage shock of the individual, the distribution of potential partners (the first integral), and over the initial love distribution (the second integral). Notice that the expectations over potential partners depends on the normalized distribution of potential mates $\hat{\mathcal{S}}(\omega_{g*}^S)$. This will be elaborated on later, but it implies that the choice of marriage depends also the distribution of potential mates in the marriage market. The second to fourth lines are the value obtained if the individual and the potential partner want to marry. However, the third and fourth lines account for the fact that one of them is coresiding, and hence the couple can marry only with a probability π_{marry}. The last line is the value if the marriage does not take place.

Single households solve their value function subject to their budget sets and their constraints. The constraints are given by:

$$
a' \geq \begin{cases} -(1-\theta)qp & \text{if } s = \{O\} \\ 0 & \text{if } s = \{C, R\} \end{cases} \tag{24}
$$

$$
s = C \implies q = q_c, s = R \implies q \in \{q_1, ..., q_{\bar{r}}\}, \text{ and } s = O \implies q \in \{q_1, ..., q_{\bar{h}}\}, \tag{25}
$$

and their budget set is given by:

$$
\begin{aligned}
c + k\kappa_k + a' + \mathbb{1}_{s'=O}q'p = & w_g' + [1 + r\mathbb{1}_{a>0} + r^m\mathbb{1}_{a<0}]a - \tilde{y}T(\tilde{y}, S) \\
& - \mathbb{1}_{s=O}\Big[[\tau^h qp + \kappa_\delta] + qp\Big] \\
& - \mathbb{1}_{s',q' \neq s,q}[\mathbb{1}_{s'=O}t^b q'p + \mathbb{1}_{s=O}t^s qp] \\
& - \mathbb{1}_{s=R}\rho(q)q.
\end{aligned} \tag{26}
$$

The first line of equation (26) has on the left-hand side the expenditure on consumption, which is the numeraire good, and on children. Then there is the next-period assets and housing, which is multiplied by unit house price p, if it is owned, i.e. the next period housing status is owned, $s' = O$. The right-hand includes labor income, returns on assets, or mortgage payments, and the taxes paid on taxable income $\tilde{y} = w'_g + \mathbb{1}_{a>0} ar$.

The second line includes the costs of owning a house, the square brackets after the indicator function $\mathbb{1}_{s=O}$. These are taxes on property and maintenance. Additionally, there is the price of the current owned house. If the household does not change house, the price of current and next period house cancels out.

The third line accounts for house changes. It includes the transaction costs of buying or selling an owned house. The fourth line includes house rental costs for households that chose to rent, i.e., housing status $\mathbb{1}_{s=R}$.

Married Households. After their assets and housing choice, married households obtain a new realization of their love λ'. Considering this, each individual in the household chooses whether to divorce. The household divorces if for at least one person the value of being single minus the divorce cost is higher than the value of being in the marriage. Hence, they divorce if $\exists g \in \{m, f\}$ such that:

$$\mathbb{E}\, V(e, j, w, \bar{a}, \bar{s}, \bar{q}, \mu = S) - \kappa_d \geq V(e_m, e_f, j, w_m, w_f, a, s, q, \mu = M, \lambda') \tag{27}$$

with $\bar{a}, \bar{s}, \bar{q}$ obtained by dividing assets and housing according to the rules detailed above. The expectation of the value for single includes the uncertainty from the division of assets and housing. Let the indicator function $\mathbb{1}^d(\omega^M, \lambda)$ take value of 1 when the household divorces. Then the value function of a married household can be written as:

$$\begin{aligned} V(\omega^M) = \max_{a', s', q', P_f} & \, U(\omega^M) \\ & + \beta\, \mathbb{E} \Bigg[\int_\Lambda \bigg[\Big(1 - \mathbb{1}^d(\omega^M, \lambda) \Big) \times V(\omega^{M'}) \\ & + \mathbb{1}^d(\omega^M, \lambda) \times \Big(0.5\, \mathbb{E}_{a,h} [V(\overline{\omega}_m^{S'}) + V(\overline{\omega}_f^{S'})] \Big) \bigg] dF_{\lambda'}(\lambda'|\lambda) \Bigg], \end{aligned} \tag{28}$$

where $\overline{\omega}^S$ represents the state-space of the household after the uncertain separation of assets and housing. The first line represents the period utility, while the following ones the expected value of next period utility. The expectation is over the wage shock of each partner and the initial love distribution (the integral). The second line shows the value if the household decides to remain married. The third line shows the value obtained if the household decides to divorce. I assume that the value of divorcing is the average of the expected value of being single for both individuals. In this case, the expectation is also over the uncertain division of assets and housing. This assumption is done in order to avoid having a value function of married males and females.

Like single households, married households solve their value function subject to their constraints and their budget sets. Their constraints account for the fact that they cannot coreside, and are given by:

$$a' \geq \begin{cases} -(1-\theta)qp & \text{if } s = \{O\} \\ 0 & \text{if } s = \{C, R\} \end{cases} \tag{29}$$

$$s = R \implies q \in \{q_1, ..., q_{\bar{r}}\}, \text{ and } s = O \implies q \in \{q_1, ..., q_{\bar{h}}\}, \tag{30}$$

while their budget set is given by:

$$\begin{aligned} c + k\kappa_k + a' + \mathbb{1}_{s'=O}q'p = {} & y + [1 + r\mathbb{1}_{a>0} + r^m\mathbb{1}_{a<0}]a - \tilde{y}T(\tilde{y}, M) \\ & - \mathbb{1}_{s=O}\Big[[\tau^h qp + \kappa_\delta] + qp\Big] \\ & - \mathbb{1}_{s',q'\neq s,q}[\mathbb{1}_{s'=O}t^b q'p + \mathbb{1}_{s=O}t^s qp] \\ & - \mathbb{1}_{s=R}\rho(q)q, \end{aligned} \tag{31}$$

where $y = w'_m + \mathbb{1}_{P_f>0}w'_f$, i.e. the sum of individual labor incomes, and the taxable household income is given by $\tilde{y} = w'_m + \mathbb{1}_{P_f>0}w'_f + \mathbb{1}_{a>0}r$.

Terminal Condition. Households in the last model age, $j = J$, have a similar dynamic problem as the ones described, but the next period value is given by a deterministic terminal value function. At the end of their life, households receive a terminal value that depends on their marital status, housing, and assets, given by:

$$V^{J+1}(\mu, a, s, q) = \frac{\varphi_1(B + \varphi_2)^{1-\sigma}}{1-\sigma} + \mathbb{1}_{a<0}\varphi_3 \times a + \mathbb{1}_{\mu=M}\varphi_4, \tag{32}$$

with

$$B = \max(a + \mathbb{1}_{s=O}qp, 0).$$

The first term is similar to the bequest motive function by De Nardi (2004), with the term σ being the degree of relative risk aversion. The more assets and housing the household has, the higher it is. The second term is a penalty or benefit for having a mortgage. The third term is a penalty or benefit for being married.

4.6 Equilibrium

Marriage Market Equilibrium. To solve its own dynamic programming problem, any household needs to know the solution of other household's type value function. Furthermore, single households of age j need to know the stationary distribution of potential mates for that age group. Using the indicator function introduced above we can write the distribution of singles as:

$$\begin{aligned}\mathcal{S}(\omega_g^{S\prime}) = &\int_{\Omega_g^S}\int_{\Omega_{g*}^S}\int_{\Lambda}\Big[\Big(1-\mathbb{1}^{\mu}()\Big)+\mathbb{1}^{\mu}()\mathbb{1}^{h}()(1-\pi_{marry})\Big]dF_{\lambda}(\lambda)d\hat{\mathcal{S}}(\omega_{g*}^S)d\mathcal{S}(\omega_g^S)\\ &+\int_{\Omega^M}\int_{\Lambda}\mathbb{1}^{d}()dF_{\lambda'}(\lambda'|\lambda)d\mathcal{M}(\omega^M),\ \text{for } g\in\{m,f\}. \end{aligned} \tag{33}$$

The first line being the singles that did not marry, plus singles who want to marry, but at least one is a coresident, and the second line being the married that divorced.

The term $\mathcal{M}(\omega^M)$ is the stationary distribution of married individuals, and is obtained in a similar manner:

$$\begin{aligned}\mathcal{M}(\omega^{M\prime}) = &\int_{\Omega_g^S}\int_{\Omega_{g*}^S}\int_{\Lambda}\Big[\mathbb{1}^{\mu}()\Big((1-\mathbb{1}^{h}())+\mathbb{1}^{h}()\pi_{marry}\Big)\Big]dF_{\lambda}(\lambda)d\hat{\mathcal{S}}(\omega_{g*}^S)d\mathcal{S}(\omega_g^S)\\ &+\int_{\Omega^M}\int_{\Lambda}\Big(1-\mathbb{1}^{d}()\Big)dF_{\lambda'}(\lambda'|\lambda)d\mathcal{M}(\omega^M),\ \text{for } g\in\{m,f\}. \end{aligned} \tag{34}$$

The first line shows the singles that get married and the second line shows the married that remain married.

The normalized distribution of the single is given by:

$$\hat{\mathcal{S}}(\omega_g^S) = \frac{\mathcal{S}(\omega_g^S)}{\int d\mathcal{S}(\omega_g^S)} \tag{35}$$

Housing Market Equilibrium. The demand side of the housing market is obtained from the household's problem, where households choose whether to coreside, rent, or own a house, and renters and owners also choose the size of their housing from the set $q\in\mathcal{Q}=\{q_1,...,q_{\bar{h}}\}$. The house supply is produced by the construction firm, while the rental units are provided by a rental agency sector. The housing market determines in equilibrium the housing prices.

The total housing demand for a house of size q is given by:

$$\bar{H}_q^d = \int_{\Omega^S} \mathbb{1}_q() d\mathcal{S} + 0.5 \int_{\Omega^M} \mathbb{1}_q() d\mathcal{M}, \tag{36}$$

where $\mathcal{S}$ and $\mathcal{M}$ are the distribution of single and married individuals, and $\mathbb{1}_q()$ is an indicator function that has the value of 1 when renting or owner a house of size q. The integrals calculate the share of households that live in a house of size q. The integral for the married population is divided by two because two individuals live in the same house.

The total housing demand is given by aggregating the size-specific housing demands weighted by their size:

$$\bar{H}^d = \sum_{q=1}^{q_{\bar{h}}} q \bar{H}_q^d, \tag{37}$$

where q is the size of the house size. The total housing demand $\bar{H}^d$ represents the total number of housing units. This can be interpreted as there being a homogenous housing unit that can be aggregated only in $q_{\bar{h}}$ house sizes.

The construction firm provides the homogenous housing units. Using the construction's firm problem, equation (20), we obtain the following law of motion of the housing unit stock:

$$\bar{H}' = \bar{H}(1-\delta) + I = \bar{H}(1-\delta) + \left(\frac{p}{\varsigma_1}\right)^{\varsigma_2}. \tag{38}$$

In the steady state, due to the lack of population growth, the housing stock needs to be constant. On the one hand, periodic depreciation reduces the housing stock by δ. On the other hand, given the essential maintenance assumptions, owners and rental firms pay buy new housing units to maintain their housing. In the stationary equilibrium, the new housing units counteract the depreciation, and we obtain the following steady state relationship between house prices and the housing stock:

$$\delta \bar{H} = I = \left(\frac{p}{\varsigma_1}\right)^{\varsigma_2}. \tag{39}$$

Government Budget. The government collects taxes from properties and incomes, and uses them to finance the government spending G and housing policies that cost P. The government's budget constraint holds and is given by:

$$G+P=\int_{\Omega^S} T(\tilde{y},S)+qp\tau\mathbb{1}_{s=O}d\mathcal{S}+\int_{\Omega^M} T(\tilde{y},M)+0.5\times qp\tau\mathbb{1}_{s=O}d\mathcal{M}. \tag{40}$$

The property taxes for married households are divided by two as two individuals live in the same housing unit.

Definition 1. A stationary equilibrium is a set of value functions for singles and married households $V(\omega_S(g)), V(\omega_M)$; a decision rule by singles for marriage $\mathbb{1}^{\mu}(\omega_S(g),\omega_S(g*),\lambda)$; a decision rule by married for divorce, $\mathbb{1}^{d}(\omega^M,\lambda)$; stationary distributions for singles and married, $\mathcal{S}(\omega^S),\mathcal{M}(\omega^M)$; a house price and rent $p,\rho(q)$, such that:

1. The value function for single independent households, $V(\omega_S(g))$, solves their problem, equation (23), taking the value function of the married household; the marriage decision rule $\mathbb{1}^{\mu}(\omega_S(g),\omega_S(g*),\lambda)$; the normalized stationary distribution for singles $\hat{\mathcal{S}}(\omega^S)$ defined in equation (33); and the house price and rent $p,\rho(q)$ as given.

2. The value function for married households, $V(\omega_M)$, solves their problem, equation (28), taking the value function of the single household; the divorce rule $\mathbb{1}^{d}(\omega^M)$; and the house price and rent $p,\rho(q)$ as given.

3. The decision rules for marriage and divorce are determined by equations (22) and (27), respectively, taking the value functions of singles and married households as given.

4. The stationary distributions $\mathcal{S}(\omega^S),\mathcal{M}(\omega^M)$ solve equations (33) and (34) respectively, taking the marriage and divorce rule as given.

5. The housing market clears, given house price and rent $p,\rho(q)$ the house units demanded determined by the household's problem, equation (37), match the total housing stock $\bar{H}$.

6. The stock of housing units $\bar{H}$ is stationary and determined by the construction's firm problem and the law of motion of the house unit stock summarized in equation (39).

7. The government budget constraint holds, equation (40).

5 Calibration

I calibrate the model to the 2019 U.S. I classify parameters into three distinct groups. The first are parameters commonly adopted in the macroeconomics and housing literatures. Table 3 shows the value I assign to them and their source. The second group are parameters that are estimated from the data or set to their data counterparts. Table 4 lists the data source used. The parameters of the third group are calibrated internally by matching moments generated by the model with moments obtained from the 2019 US data. Table 7 shows the values for the parameters in the third group.

5.1 Functional Forms

I define the period utility function $u(c, q; s, \mu, k)$ as:

$$u(c, q; s, \mu, k) = \frac{1}{1-\sigma} \left[c^{\zeta} (\iota_{g,s} q)^{1-\zeta} (1/\eta(k, \mu)) \right]^{1-\sigma}, \tag{41}$$

where σ is the degree of relative risk aversion and ζ is the expenditure share of consumption. The term $\iota_{g,s}$ is a house service shifter that depends on gender and housing status. I allow this to be different than one for females who coresides, $\iota_{f,C}$, and homeowners, $\iota_{g,O}$. The term $\eta(k, \mu)$, that depends on marital status and number of children k, controls for the changes in household size and it can be interpreted similarly to the economies of scale parameter.[17]

Furthermore, as stated above, the construction firm produces new housing units I with a convex cost function given by:

$$K(I) = \frac{\varsigma_1 I^{1+\frac{1}{\varsigma_2}}}{1+\frac{1}{\varsigma_2}}, \tag{42}$$

where ς_1 is the construction cost level, and ς_2 is the price elasticity of housing units supply.

Finally, the tax rate applied on the taxable income $\tilde{y}$ is given by the progressive tax rate function $T(\tilde{y}, \mu) = 1 - \tau_{l,\mu} \tilde{y}^{-\tau_{p,\mu}}$. Hence, the total amount of taxes that are due is given by $\tilde{y}T(\tilde{y}, \mu)$. This two-parameter functional form has been used extensively in the literature as

[17] I use a Cobb-Douglas function to aggregate consumption and housing services, rather than the more general CES, as there is a lack of strong evidence for the elasticity of substitution between durable and non-durable consumption being significantly different than unity (Piazzesi et al., 2007, Fernandez-Villaverde and Krueger, 2011, Borri and Reichlin, 2021).

it can be easily estimated, and it identifies separately a tax level parameter, $\tau_{l,\mu}$, and a tax progressivity parameters,$\tau_{p,\mu}$ (Heathcote et al., 2017). The tax rate function uses different parameters for married and singles to account for the different tax regimes (Guner et al., 2014).

5.2 Parameters From Literature

Demography and Preferences. Agents live from the age of 23 to the age of 49, $j = [23, 49]$. This age period is relevant for the parental coresidence and household formation choices. Furthermore, it enables me to abstract from modelling overlapping generations and retirement choices. The model period is two years.

Regarding preferences, following the literature, I set the risk aversion parameter σ to 1.5, and the expenditure share parameter ζ to 0.8, following Piazzesi and Schneider (2016). The household size control parameters η are set using the OECD modified equivalence scale. More precisely, consumption and housing are divided by the number of equivalent adults. The first adult counts 1. Subsequent adults count 0.5, and children count 0.3.

Housing and Children. The housing depreciation δ is set to 0.06, obtained by using a 3% yearly depreciation from Piazzesi and Schneider (2016).[18] Following Yang (2009), transaction costs for buying and selling, t^b, t^s, are set to 0.025 and 0.07, respectively.[19] The down payment parameter θ is set to 0.2, following Paz-Pardo (2024). I use estimates from Chang (2023) to set house splitting probability due to divorce. The probability that the house owned without a mortgage needs to be liquidated in the case of divorce, π_{liq}, is set to 0.85. Meanwhile, the probability that the house is given to the male or female individuals, π_m, π_f, are set to 0.075, 0.075. The children cost share parameter κ_k is set to 20% of the household labor income y, using information provided by the USDA (Lino et al., 2017).

Taxes. The property tax parameter τ^h is set to 0.02, obtained from an annual property tax rate of 0.01 following Sommer and Sullivan (2018). Finally, I take the values for two parameters of the progressive tax rate function from Guner et al. (2014). They estimate the tax functions for household that are married or single. Hence, for married households I set

[18]Given the essential maintenance assumption, this is the share spent for maintenance of housing. More generally, this can be interpreted as user cost of homeownership. Range of parameters go from 1% as in (Cocco, 2005) to 6% as in (Gervais, 2002).

[19]Piazzesi and Schneider (2016) discuss that transaction costs vary across and within cities and states. They claim they are between 6% and 10%. Paz-Pardo (2024) sets the transaction costs to 5% by considering that housing adjustment costs are around 10% of the value of the property.

$\tau_{l,M}, \tau_{p,M}$ to be 0.913 and 0.06, respectively. Instead, for singles, I set $\tau_{l,S}, \tau_{p,S}$ to be 0.897 and 0.034.[20]

Construction Firm. The housing supply elasticity, ς_2, that determines the curvature of the cost function of the construction firm, $K(I)$, has been the focus of a great deal of urban, housing, and labor migration literature (Glaeser and Gyourko, 2018, Hsieh and Moretti, 2019, Baum-Snow, 2023). Two key takeaways from the literature are that this elasticity is a very important factor for house prices, but also for growth and labor mobility, and that the house supply elasticity is different throughout the U.S., even within metropolitan areas (Baum-Snow and Han, 2022). Therefore, given the importance of this parameter for the outcomes of the counterfactual policies exercises, in the benchmark I set the supply elasticity to 0.9, following Sommer and Sullivan (2018) who estimate this by using data for the entirety of the United States. However, I run all the counterfactuals with two additional values of the elasticity: 0.5, similar to what has been reported by Baum-Snow and Han (2022), and 2.5, as in Floetotto et al. (2016).[21]

5.3 Estimated Directly From Data Parameters

There are several parameters that are either taken directly from the data or estimated using household surveys. These are the housing units that individuals can choose in set $\mathcal{Q}$, the life-cycle wage profiles and idiosyncratic wage shocks that individuals face, the number and timing of children in single and married households, and the interest and mortgage rates. I also use data to set the model's initial conditions that determine the distribution of individuals by education, marital status, and wealth at the first model age. Table 4 shows the data source used.

Housing. The housing choices is characterized by the number of houses that households can be rent, $\bar{r}$ or own, $\bar{h}$, and the sizes of the houses, $\mathcal{Q} = \{q_1, ..., q_{\bar{h}}\}$. I set $\bar{r}$ to 2, and $\bar{h}$ to 3. This implies that there are three house sizes to live independently, and that the largest one can only be owned. I use the 2019 AHS to characterize the sizes of the 3 different

[20]Numbers are taken from Table 10 and Table 11, for all married or unmarried, estimating the function using the HSV specification. Note that Guner et al. (2014) estimate these functions using as income measure the multiples of mean income, and not the dollar amounts. As my model uses thousands of dollar amounts, I adjust the function by dividing household income by mean income. I use mean yearly income the amount they report in their paper \$53 Thousands.

[21]The average (population weighted) of metropolitan areas elasticities computed by Saiz (2010) is quite elastic at 1.75.

Table 3: Externally Set Parameters

Parameter	Symbol	Value	Source
Preferences			
Risk aversion	σ	1.5	
Expenditure share	ζ	0.8	Piazzesi and Schneider (2016)
Household size control	$\eta(k, \mu)$	-	OECD-Modified Scale
Housing			
Depreciation	δ	0.06	Piazzesi and Schneider (2016)
Transaction costs	t^b, t^s	0.025, 0.07	Yang (2009)
Assets			
Down payment	θ	0.2	Paz-Pardo (2024)
Marriage			
House splitting probability	π_{liq}, π_m, π_f	0.85, 0.075 0.075	Chang (2023)
Children			
Children cost share	κ_k	0.2 y	Lino et al. (2017)
Taxes			
Property tax	τ^h	0.02	Sommer and Sullivan (2018)
Progressive tax function	$T(\tilde{y}, \mu)$	See text	Guner et al. (2014)
Housing Supply			
Housing supply elasticity	ς_2	0.9	Sommer and Sullivan (2018)

house sizes.[22] To do this, I divide the stock of houses into three categories, depending on the number of bedrooms. q_1 represents houses that have 0 or 1 bedrooms, q_2 2 or 3 bedrooms, and q_3 4 bedrooms and above. I normalize $p = 1$ and compute the median house value for each category, and use this value as the house size in the model.

Finally, I obtain the median rent paid by renters across the first and second house categories. I use this to construct the rent $\rho(h)$, or given $p = 1$, the rent-to-price ratios. Table 5 shows the median house values, the median two-year rent paid by renters, and the rent-to-price ratio. Considering this, and the fact that the model is in thousands of dollars, I set q_1 to 130. q_2 to 190, and q_3 to 335. Furthermore, $\rho(q_1) = 0.15$, and $\rho(q_2) = 0.12$.

Labor income process. The labor income process is characterized by the deterministic function $f_w(g, j, e)$, the variance of the innovation shock $\varepsilon_z \sim N(0, \sigma^2_{g,e})$, and the variance of the initial distribution of wages, $\sigma_{0,g,e}$. All three depend on gender and education. I use the 2009-2019 waves of the PSID to estimate the properties of the income process.

For the deterministic function, I impose a second order polynomial of age: $f_w(g, j, e) =$

[22] A small number of grid points in $\mathcal{Q}$ is chosen for computational constraints and is a common feature of life-cycle models with explicit housing decisions (see, for example, Bacher, 2023, Chang, 2023).

Table 4: Data Set Parameters

Parameter	Symbol	Values (Table)	Source
Housing			
Sizes of houses	$\{q_1, q_2, q_3\}$	{130, 190, 335}	AHS
House price	p	1	Normalization
Rent to price	$\rho(q_1), \rho(q_2)$	0.15, 0.12	AHS
Labor			
Deterministic function	$f_w(g, j, e)$	Table C1	PSID
Innovation variance	$\sigma^2_{0,g,e}, \sigma^2_{g,e}$	Table C1	PSID
Assets			
Interest rate	r	0.03	FRED
Mortgage rate	r^m	0.05	FRED
Children			
Singles	$f_k^S(g, e, j)$	Table C2	CPS
Married	$f_k^M(e_m, e_f, j)$	Table C2	CPS
Initial Conditions			
Demographics		Table 6	CPS
Wealth		Figure 9	PSID

Table 5: Median House Values by Size

House Size	Rent (24 Months) Thousands of $	House Value Thousands of $	Rent to Value Ratio	Notes
q_1	20	130	0.15	Median 0/1 Bdroom
q_2	23	188	0.12	Median 2/3 Bdroom
q_3		335		Median 4+ Bdroom

Notes: The table shows the median house values and the median rent paid for 24 months by renters across house sizes in 2019. Data: AHS.

$a_0^{g,e} + a_1^{g,e} j + a_2^{g,e} j^2$, and estimate it separately by gender. For males, I estimate the coefficients $a_0^{g,e}, a_1^{g,e}, a_2^{g,e}$ by running a linear regression of log wages on age, age squared, and a series of controls:

$$\log(w_{i,j,e}) = a_0^{g,e} + a_1^{g,e} j + a_2^{g,e} j^2 + \mathbb{X}_{i,j,e} + \epsilon_{i,j,e}, \tag{43}$$

where i is an individual and $\mathbb{X}$ is the vector of controls. These controls include year fixed effects, state fixed effects, marital status, number of children, and a dummy indicating whether there is a young child in the household.

For females, due to the selection into employment, I run two-step Heckman correction procedure. The first step performs a probit analysis on a specified selection equation. The second step analyzes an outcome equation based on the first-stage binary probit model. A female i, with education e and age j will work and earn wages if $\mathbb{Z}_{i,j,e}\gamma + \epsilon_{i,j,e} > 0$. The vector $\mathbb{Z}_{i,j,e}$ includes the controls of $\mathbb{X}$ and a vector of exclusion restriction. The exclusion restrictions are dummies of whether the household has contracted a mortgage. Blasutto (2023) provides references that justify the use of these instruments: mortgages have a significant impact on female's labor force. In the second step, I estimate the wage equation similarly to equation (43), but including the nonselection hazard computed in the first stage as a control.

To obtain the variance of the innovation shocks I follow Meghir and Pistaferri (2004) and Blasutto (2023). For each gender and education, I estimate the variance $\sigma^2_{g,e}$ by running the regression of equation (43), but changing the log of wages with the two-year differences of wages, $\Delta^2 w$. This regression provides the two-year residual differences $\Delta^2 u$. Then, I obtain that

$$\sigma^2 = \mathbb{E}[\Delta^2 u_t(\Delta^2 u_t + \Delta^2 u_{t-2} + \Delta^2 u_{t+2})], \tag{44}$$

for each gender and education group.[23]

Table C1 shows the estimated parameters for the labor income process for all four demographic categories. Figure C1 shows the median biennial labor income in the estimated income process across the life-cycle. The variance of the initial distribution, is taken directly from the data.

Interest and Mortgage Rates. To set the risk-free interest rate and the mortgage rate I use data from FRED. I adjust rates for inflation and average them between 2009 and 2019. For the interest rate, I use the market yield on U.S. treasury securities at 30-year constant maturity. I set the biennial interest rate r to 0.03 (yearly average 1.44%). For the mortgage rate, I use the 30-year fixed rate mortgage. I set the mortgage rate: r^m to 0.05 (yearly average 2.35%).[24]

Children. I estimate the single and married children function, $f^S_k(j, g, e)$ and $f^M_k(j, e_m, e_f)$ using CPS data for 2019. I assume that for both single and married, the number of children

[23] As my model is biennial, I do not need to adjust the variance of the innovation shocks by dividing it by two.

[24] FRED series: Market Yield on U.S. Treasury Securities at 30-Year Constant Maturity, Quoted on an Investment Basis (DGS30), 30-Year Fixed Rate Mortgage Average in the United States (MORTGAGE30US), and to obtain inflation rate Consumer Price Index for All Urban Consumers: All Items Less Food and Energy in U.S. City Average (CPILFESL).

in the household is a second order polynomial of age, given by:

$$f_k^S(g,j,e) = k_0^{g,e} + k_1^{g,e} j + k_2^{g,e} j^2 \text{ for singles,} \tag{45}$$

and

$$f_k^M(j,e_m,e_f) = k_0^{e_m,e_f} + k_1^{e_m,e_f} j + k_2^{e_m,e_f} j^2 \text{ for married.} \tag{46}$$

I estimate the parameters k_0, k_1, k_2 separately for each marital status and demographic group by running household level linear regressions of number of own children in the household on age and age squared. I limit the sample to be within the age of 23 and 49.[25] Table C2 shows the estimated parameters for the children process for all demographic categories. Figures C2a and C2b show the number of children along the life-cycle for singles and married, respectively. Among singles, males have very few children in the household. Furthermore, college educated individuals have children later in life.

Initial Conditions. Finally, I take from the data the initial variables that determine how individuals start their life-cycles. Considering the fact that in the data, 23 years old differ in living arrangements and marital status, I initialize the model to represent this heterogeneity, using the 2019 ACS and CPS dataset to set the initial demographic conditions.

First, I assume that the gender ratio is balanced. Second, I set the share of college educated males and females to match the share in 2019 for individuals between the ages of 23 and 26. As college share does not change throughout the life-cycle, it is relevant to account for the individuals that complete it after 24. Third, for living arrangements and marital status, I match the 2019 share for ages between 21 and 22, i.e., the age before individuals enter the model. I match the coresident share by gender and education group, the share of individuals that are married, and the assortative mating. I impose that individuals that do not coreside, both single and married, live in the smallest rental unit in the first period. As shown in Table 6, that summarizes the initial conditions, the majority of marriages in this age group are among non-college educated. This is due to the fact that by the age of 22, college educated are still few.

Finally, to account for the fact that in the data there exist wealth inequality among young adults, I let individuals start their lives with different wealth levels. Using the 2017-

[25] Despite its simplicity, this model is able to capture a large part of the variation and life-cycle dynamics. The R^2 of the regression is around 95% for regression of married households, above 90% for single females, and above 70% for single males.

Table 6: Initial Conditions

Parameter	Value
College Educated	
Male	0.29
Female	0.37
Coresiding	
Male NC	0.59
Female NC	0.51
Male Co	0.51
Female Co	0.52
Marital Status	
Married	0.15
Assortative Mating (Male - Fem.)	
NC - NC	0.86
NC - Co	0.04
Co - NC	0.05
Co - Co	0.05

Notes: *The table shows the moments used to set the initial conditions of the model. The assortative mating number shows the fraction of married households by the education group of spouses, male - female, respectively. Data: ACS, CPS.*

2019 PSID data, I compute the net wealth deciles by education group for households where the household head is between the ages of 23 and 24. I use this age range, as there are few household heads before this age group. I set to 0 negative deciles, and then use this information initialize the wealth distribution by education group. Figure 9 shows the deciles. We can see that more than 30% of non-college educated and 20% of college educated start with 0 wealth.

5.4 Internally Calibrated Parameters

I use the methods of simulated moments to calibrate 17 parameters. These parameters can be grouped in five categories: coresidence, wealth, labor cost, marriage, and terminal value function. To calibrate these parameters, I use 17 moments across three stages of the life-cycle. The first stage is between the ages of 23 and 29, and these moments are used to calibrate parameters related to coresidence. The second stage is between the ages of 30 and 39, and these moments are used to discipline parameters related to wealth, labor cost, and marriage. Finally, moments from the last stage, between the ages of 47 and 49, are used to parametrize the terminal value function.

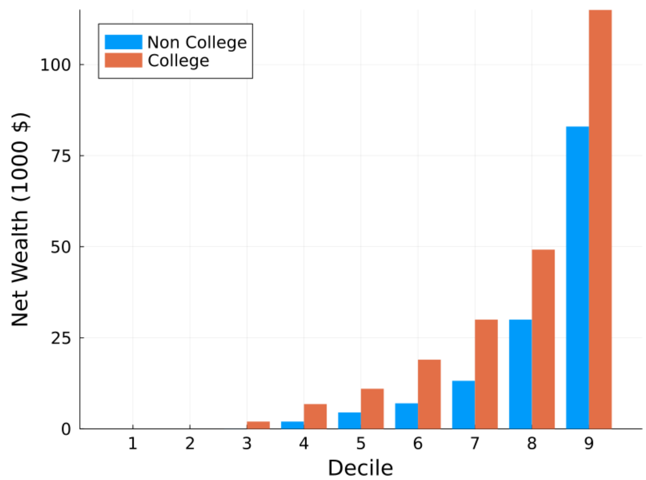


Figure 9: Initial Net Wealth Deciles

Notes: *The figure shows the deciles of net wealth used to set the initial conditions of the model. Data: PSID.*

Coresidence. There are 3 parameters related to parental coresidence. The first is the level of housing consumption of coresidents q_c, the second is the housing service utility shifter for females who coreside, $\iota_{f,C}$, and the third is the probability of being able to marry when coresiding, π_{marry}. I calibrate the first two by targeting the share of male and female coresidents between the ages of 23 and 29 from the ACS in 2019. For the third, PSID from 2009 to 2019, I compute the share of individuals who transition from living in their parents' house to being married. This share is determined by dividing the number of individuals who move from parental coresidence to marriage by the total number of individuals who move away from parental coresidence in two consecutive waves.

Wealth and Labor Cost. There is one parameter for the discount factor, β, one parameter for the housing service utility shifter for homeowners, $\iota_{g,O}$, and two for the labor force participation cost for married households by education group, ϕ_n, ϕ_u. For the first, I use the PSID and target the average net wealth of households between the ages of 30 and 39 in 2019. For the remaining three, I use the ACS and target homeownership among household heads between the ages of 30 and 39, and labor force participation of married females by education group between the ages of 30 and 39 in 2019.

Marriage. There are 6 parameters related to marriage. The first two are the match quality, i.e., ν_0 and ν_1, which determine the benefits from assortative mating. I calibrate this by first measuring the fractions of married households categorized by the education levels of spouses from the CPS data among married households between the ages of 30 and 39. Then

I compare these fractions to the fractions that would occur under random matching. [26]

Three parameters are related to the love process. These are the mean, $\bar{\lambda}$, the variance of the shocks σ_λ^2, and their persistence ρ_λ. The last parameter that affects marriage decisions is the divorce utility cost κ_d. I target these 4 to match the share of married female individuals by education, and the divorce and marriage rates for females between the ages of 30 and 39

Terminal Value Function. The last 4 parameters pertain to the terminal value function. These are the two parameters of the bequest function, ψ_1 and ψ_2, the penalty or benefit for having a mortgage at the end of the life-cycle, ψ_3, and the penalty or benefit for being married at the end of the life-cycle, ψ_4. All of these parameters are calibrated to moments computed for individuals between ages 47 and 49, using the ACS and the PSID. As targets I use the average net wealth of households, the ratio of the average net wealth of households belonging to the bottom 50% of the distribution to the average net wealth belonging to the bottom 50%, the share of owners with an outstanding mortgage, the share of females that are married, and two measures of net wealth inequality.

There are 3 parameters left that need to be determined: the construction firm scaling factor, ς_1, and the size-specific monitoring costs of the rental agencies, $\kappa_m(q_1), \kappa_m(q_2)$. These are calibrated using the equilibrium conditions in the equilibrium market. For a given housing stock, depreciation rate, and housing supply elasticity, the scale parameter ς_1 is set using equation (39) to have a house price of 1:

$$\varsigma_1 = \frac{p^{\varsigma_2}}{\delta \bar{H}}.$$

The size-specific rental agency monitoring costs are set to obtain the rental prices for the first and second house sizes calculated from the AHS, as described in Table 5, $\rho(q_1) = 0.15, \rho(q_2) = 0.12$ using equation (21):

$$\kappa_m(q) = p(r + \delta) - \rho(q).$$

[26] I use this measure rather than the fractions as the share of college graduates is different in the data and in the model. I computed the observed fraction of married households where the male and female were college or non-college educated, resulting in a 2 by 2 matrix. Then, I obtained the marginal distribution across education levels. Using the marginals, I calculated the expected random matching probabilities. Finally, I obtained the ratios of observed to expected random matching.

5.5 Benchmark Economy

Table 7 shows the calibrated parameters, the moments used to calibrate it, and the moments computed in the model and in the data. Regarding coresidence, the model does a good job in replicating the levels of coresidence among males and females, and the share of individuals who go from coresidence to marriage. This matching between data and model moments is obtained with the utility of coresiding for male, q_c, set at around 60% of the housing utility from the smallest house size, q_1. Furthermore, the value of the female shifter, $\iota_{f,C}$, implies that females obtain less than 2% of the utility of coresiding compared to males. Finally, the probability of being able to marry when coresiding π_{marry} is close to 1. This suggests that coresidents do not experience strong marriage market frictions.

Regarding love, the model matches the assortative mating among college-college individuals, the share of females that are married and the divorce flows. However, the model underestimates the assortative mating between non-college, and overestimates the marriage rate among adults. The love distribution and process is characterized by a negative mean and high variance of the innovations, and a high persistency. This suggests that waiting for the right match is an important aspect of the marriage market.

The model does well in matching the homeownership among adults. However it underestimates the net wealth among adults and the labor force participation of females. Finally, the end of life moments show that the model underestimates inequality and the share of individuals who have an outstanding mortgage.

Untargeted Moments. The model manages to replicate well aggregate life-cycle paths of marriage, coresidence, and homeownership. Figure 10a shows that the model accounts for the large increase in marriage and decline in coresidence at the beginning of life. Furthermore, Figure 10b shows the raising share in homeownership.

6 Understanding the Marital Decline, 1980-2019

In this section, I use the calibrated model as a quantitative laboratory to analyze how much of the observed marriage decline between 1980 and 2019 can be explained by the changes in five key features of the model: house prices, income structure, house financing conditions, number of children, and initial conditions. To do this, I first use data from the

Table 7: Calibrated Parameters and Moments

Parameter		Value	Moment	Model	Data
Coresidence					
Utility from coresidence	q_c	84.50	Coresidors Male	0.32	0.30
Utility shifter, coresidence	$\iota_{f,C}$	0.017	Coresidors Female	0.23	0.22
Probability of marrying	π_{marry}	0.937	Transition Cor-Mar	0.34	0.25
Marriage and Divorce					
Match Quality - Non College	ν_0	0.110	Assortative: NC NC	1.16	1.48
Match Quality - College	ν_1	0.550	Assortative: Co Co	1.59	1.61
Mean of love	$\bar{\lambda}$	-0.415	Married Female NC	0.63	0.61
Variance of love	σ^2_λ	0.533	Married Female Co	0.79	0.74
Persistance of love	ρ_λ	0.936	Marriage Rate	0.09	0.06
Divorce utility cost	κ_d	0.425	Divorce Rate	0.03	0.03
Wealth					
Discount factor	β	0.987	Net Wealth (K \$)	115	179
Utility shifter, ownership	$\iota_{g,O}$	1.070	Homeownership	0.52	0.52
Labor Supply					
Labor cost NC	ϕ_1	0.103	LFP Married NC	0.57	0.69
Labor cost Co	ϕ_2	0.057	LFP Married Co	0.64	0.83
End of life					
Bequest level	φ_1	37.07	Net Wealth (K \$)	329	303
Bequest inequality	φ_2	17.39	Net Wealth Ratio: $75^{\text{th}}/50^{\text{th}}$	1.85	3.81
Mortgage penalty	φ_3	1.438	Outstanding Mortgage	0.18	0.53
Marriage premium	φ_4	-0.126	Married Female	0.79	0.69
Housing Equilibrium					
Construction level	ς_1	0.0131	House price normalization	1.0	
Monitoring Cost q_1	$\kappa_m(q_1)$	0.06	Rent to price ratio	0.15	0.15
Monitoring Cost q_2	$\kappa_m(q_2)$	0.03	Rent to price ratio	0.12	0.12

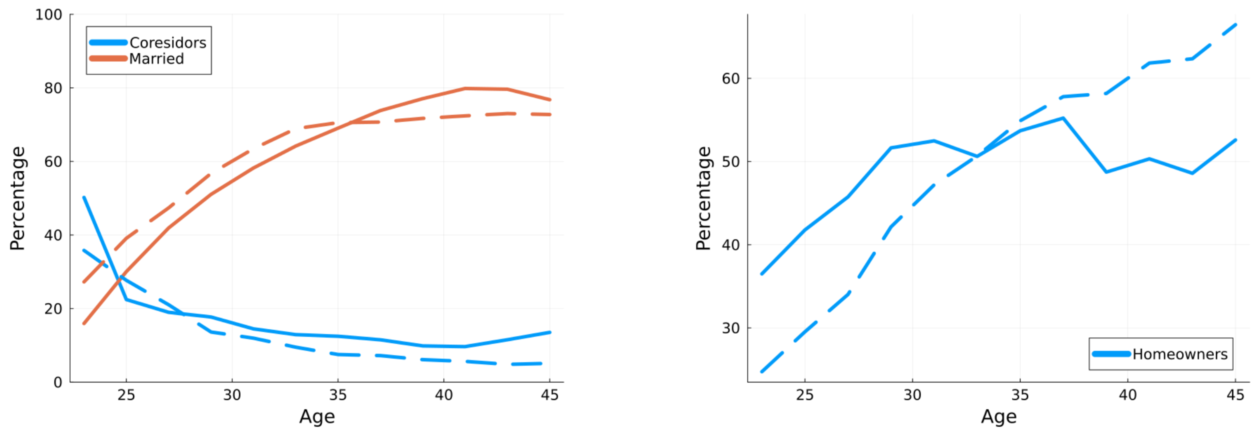
1980s to estimate the model parameters that characterize these features. Then, I run the model with the 1980s parameters, changing one feature at a time. The exercise should be understood as an exercise where we change one feature at a time, e.g. housing prices, to their 1980s values but everything else kept at their 2019 values.

6.1 Model Inputs for 1980

To calibrate different model features to their 1980s counterpart, I follow the same strategy highlighted in Section 5.3, using the same data sources.

House Prices. I use the 1980 AHS to obtain the median house prices and rents for the

Figure 10: Data and Model across Life-Cycle



(a) Marriage and Coresidence

(b) Homeownership

three house categories defined above: 0 or 1 bedroom, 2 or 3 bedrooms, 4 or more bedrooms. I assume that available house quantities, the set $\mathcal{Q}$, remains the same in the 1980s, i.e., a house in a specific category provides the same services in 1980 and 2019. The change in house prices are then reflected in price p. As house prices changed differently across different house sizes, I assign a different house price for each house category, $p(q)$. As a result, while all house size in 2019 are prices at $p = 1$, for the 1980s economy, their prices are allowed to declined at different rates. I assume that these changes are exogenous, i.e., household observe $p(q)$ and make their decisions and I ignore the construction firms. Similarly, I characterize the change in rental rate for each rental house, $\rho(q)$ with $q \in \{q_1, q_2\}$ as the change in the rent to price ratio across categories.

Table 8 shows the market values of the different houses in data (in 2019 dollars) and the implied prices changes for the model. Note that the 2019 economy matches the 2019 values in Table 8 by construction. Since $p(q) = 1$ for all q values in the benchmark economy, $p(q)$ values for the 1980 economy is simply determined by changes in house values. House prices increased much more for larger housing units. The increase has been 11% for the smallest unit while it is three times as high for the largest one. On the other hand, rents increased more for smaller units. Table 8 also shows the rent to price ratio for each house type in the data for 1980 and 2019.

Labor Income Structure. I use the 1973-1987 waves of the PSID data to estimate the income structure of the 1980s.[27] Table 9 highlights the differences in the average gender wage gap and the average education premium between the 1980 and the 2019 in the data.

[27]Only odd waves are used to match the analysis done for 2009-2019.

Table 8: House Values and Rents, 1980 and 2019

Size	House Prices				Rent to Price Ratio		
	1980	2019	Δ	p_{1980}	1980	2019	Δ
q_1	116	130	0.11	0.89	0.12	0.15	0.03
q_2	147	188	0.22	0.78	0.10	0.12	0.02
q_3	225	335	0.33	0.67	0.07	0.09	0.02
All	163	228	0.28	0.72	0.09	0.10	

Notes: *The table shows the median house values and the rent to price ratio for 1980 and 2019. The rent to price ratio is computed as the rent paid for 24 months over the house value. Data: AHS.*

The gender wage gap shrunk, more for non-college educated than college. Furthermore, the education premium increased for both sexes.

Table D1 shows the estimated labor income process parameters. From this we can observe that the initial dispersion of wages has increased between 1980 and 2019 for males, while income has become more uncertain for non-college educated females. Furthermore, Figure D1 shows the median labor income for the 1980 and 2019 economies. The largest increases in median labor income have been among non-college and college women.

Table 9: Changes in Gender Gap and Skill Premium, 1980 and 2019

	Data	
	1980	2019
Gender Gap: Non College	0.533	0.637
Gender Gap: College	0.534	0.616
Education Prem.: Male	1.628	1.846
Education Prem.: Female	1.633	1.785

Notes: *The table shows the gender gap across education group and the education premium across gender in 1980 and 2019. Data: PSID.*

Interest and Mortgage Rates. I use the FRED datasets discussed above for the period 1975 to 1985 to obtain the real interest rate and the mortgage rate for 1980. Both interest and mortgage rates have increased in this period. I set the interest rate r to be 0.07 (yearly average of 3.4%) and the mortgage rate r^m to be 0.09 (yearly average of 4.6%).[28]

Children. I estimate the children function for singles and married, $f_k(g, j, e)$, $f_k^M(j, e_m, e_f)$

[28]While the down payment constraints is an important feature of house financing, I do not change it in the decomposition. Sommer and Sullivan (2018) highlight that the loan to value ratios of mortgages increased from 80 percent to 97.5 percent between 2000 and 2010. However, they went back to their normal level immediately after.

using the CPS data for 1980. Table D2 shows the values of the parameters of the second order polynomial in the 1980. Figure D2 shows the estimated number of children for 1980 and 2019. Table 10 shows the average number of children across the life-cycle for the 8 demographic groups in 1980 and 2019. The average number of children declined or remained the same for each of the 8 demographic groups. The largest average decline has been experienced by non-college educated females. Among married, the number of children has decreased at the end of the model life.[29]

Table 10: Average Number of Children, 1980 and 2019

Marital	Gender	Edu	1980	2019
Single	Male	Non College	0.3	0.3
Single	Male	College	0.2	0.2
Single	Female	Non College	1.5	1.3
Single	Female	College	0.7	0.6
Marital	Edu Male	Edu Fem		
Married	Non College	Non College	1.9	1.8
Married	Non College	College	1.5	1.5
Married	College	Non College	1.8	1.7
Married	College	College	1.5	1.4

Notes: *The table shows the average number of children across marital status, gender, and education in 1980 and 2019. Data: CPS.*

Initial Conditions. Using the ACS, I estimate the share of individuals by sex between the age of 23 and 26 who are college educated. Furthermore, I obtain the share of coresidors, married, and the assortative mating for people between the ages of 21 and 22. Table 11 shows the values of these parameters in the 1980 and 2019. The share of college educated has increased by 10 percentage points for males and 19 for females. The share of coresiding in this age group changed by more than 15 percentage points. Furthermore, the share of married and cohabiting among 21 to 22 years old has decreased by 30 percentage points throughout this period.

6.2 Going Back to 1980

Marital Decline. Table 12 summarizes the main findings. The first three columns show the share of married individuals between ages of 25 and 45 in 1980, 2019, and the change

[29]Note, the minor difference in children is not surprising considering that the total fertility rate in the U.S. in 1980 was 1.79 and in 2019 it was 1.78.

Table 11: Initial Conditions Comparison 1980-2019

Parameter	1980	2019	Difference
College Educated			
Male	0.19	0.29	0.10
Female	0.18	0.37	0.19
Coresiding			
Male NC	0.44	0.59	0.15
Female NC	0.30	0.51	0.21
Male Co	0.36	0.51	0.15
Female Co	0.36	0.52	0.16
Marital Status			
Married	0.45	0.15	-0.30
Assortative Mating (Male - Fem.)			
NC - NC	0.97	0.86	-0.11
NC - Co	0.01	0.04	0.03
Co - NC	0.01	0.05	0.04
Co - Co	0.01	0.05	0.04

Notes: *The table shows the moments used to set the initial conditions of the model for 1980 and 2019. Assortative mating number shows the fraction of married households by education group of spouses, male-female, respectively. Data: ACS, CPS.*

between these two dates. The share of married population declined between 1980 and 2019, but the drop has been larger for non-college educated. The next three columns show corresponding number from the model. The 2019 results are from the benchmark economy, while the 1980 numbers pertain to an economy where all five features highlighted above are set to their 1980 counterparts. The exercise shows that the changes that occurred in labor income, housing, interest and mortgage rates, number of children, and initial condition can account for approximately 60% of the aggregate marital decline in the data. Furthermore, the model captures the larger decline in marriage for non-college educated individuals. However, it is not able to generate a larger decline among males than females.

Table 12: Marital Decline: Model and Data, 1980 and 2019

Married	Data			Model		
23-45	1980	2019	Change	1980	2019	Change
Male NC	74.0	50.3	-23.7	72.3	58.7	-13.5
Male Co	75.2	62.0	-13.2	63.5	62.5	-1.0
Female NC	75.0	55.4	-19.6	70.2	55.9	-14.3
Female Co	72.5	65.0	-7.5	75.6	67.1	-8.5
All	74.5	56.7	-17.8	71.0	59.8	-11.2

Notes: *Data: ACS.*

Table 13 separates the role of each of the five changes that took place between 1980 and 2019. In upper panel, ***Panel A***, the first column show the fraction of married population between ages 23 and 45 in the 1980 economy when we change all five factors. The last column provides the same information for the 2019 benchmark. Each column between 1980 and 2019 show the fraction of married population when we change only one of the factors, and keep everything else at their 2019 values. The lower panel shows the share of the decline in marriages that can be explained by each factor. The numbers in ***Panel B*** are calculated as the difference between the 2019 economy and the corresponding column, divided by the difference between the 2019 economy and the 1980 economy.

House Prices (column HP) are the most important driver of the decline in marriage. Had prices remained at their 1980s values, the share of married individuals would have declined by only 5 percentage points, compared to the expected 11. This accounts for approximately 50% of the aggregate reduction in the marital decline obtained in the model. No other single force accounts for such a large fraction of the change.

Whereas other changes on their own account for a lower share of the decline, they are important for the differential trends across education groups. For instance, had the Labor Income process (column LI) not changed, non-college educated would have married more compared to the 2019 benchmark, while college educated would have married less. This is the case also for Initial Conditions (IC) and interest RAtes (RA). These results suggest that these forces favored college educated individuals in the marriage market.

Coresidence. Table 14 replicates the same exercise as Table 13 for the share of coresiders between ages 23 and 29. When we change all five features, the model does a great job capturing the aggregate increase in coresidence rates. In the model the share of young adults who live with their parents increase from 11 to 27 between 1980 and 2019. The increase in the data is from 14 to 26. The model also accounts for the fact that the increase in coresidence has been more significant for males than females.

Focusing on gender and education, the 1980s economy does not do as well. The model underestimates the share of coresidors among college-educated individuals, and overestimates the one of non-college-educated. One reason for this is the fact that coresidence choice is driven also by forces that are not taken into consideration in this framework. As highlighted by Kaplan (2012) and Rosenzweig and Zhang (2019) the income and wealth of parents matters. Furthermore, the model does not account for the possibility of monetary transfers between parents and children. Not surprisingly, the underestimation of coresidors among

Table 13: Marital Decline: Role of Different Forces

Married 23-45	All 1980	HP	LI	IC	RA	CH	BM 2019
Panel A							
Male NC	72.3	65.7	62.3	60.9	59.4	56.2	58.7
Male Co	63.5	64.5	55.6	61.0	62.3	62.1	62.5
Female NC	70.2	62.4	57.4	59.4	56.7	53.2	55.9
Female Co	75.6	71.1	66.3	69.9	66.8	66.5	67.1
All	71.0	65.4	60.5	60.9	60.2	57.8	59.8
Panel B							
Male NC		51%	26%	16%	5%	-18%	
Male Co		200%	-690%	-150%	-20%	-40%	
Female NC		45%	10%	24%	6%	-19%	
Female Co		47%	-9%	33%	-4%	-7%	
All		50%	6%	10%	4%	-18%	

Notes: *All refers to the 1980 model. HP: House Prices, LI: Labor Income, RA: interest and mortgage RAtes, CH: CHildren, IC: Initial Conditions.*

college-educated is related to the overestimation of their marriage rates in Table 13.

7 Policy Analysis

Can government policies, by making housing more affordable, encourage the formation of marriages? In this section, I answer this question by considering two policies: a rent subsidy and a reduction in the down payment constraint for young adults. All policies are revenue neutral, and the government budget balances. I compare the benchmark economy with the steady states of alternative economies with these policies, where house prices for new economies are determined in equilibrium. The cost of these policies is covered by an increase in the average taxes on household earnings, i.e., the parameter τ_l is increased.

7.1 Rent subsidy

The rent subsidy policy is a proportional subsidy to rental payment for the smallest rental house. Hence, the rental rate for the smallest house unit is $(1 - S)\rho(q_1)$, where S is the subsidy rate. I consider the policy for two levels of the subsidy rate: 10% and 25%.

Table 14: Parental Coresidence: Role of Different Forces

Coresident 23-29	Data 1980	All 1980	HP	LI	IC	RA	CH	BM 2019	Data 2019
All	14.0	11.04	12.38	22.13	29.29	27.05	28.4	27.33	26.0
Male	17.4	9.01	17.3	20.7	32.48	31.59	33.02	31.83	30.1
Female	10.7	13.08	7.46	23.57	26.11	22.5	23.77	22.84	21.8
Mal NC	17.9	10.2	22.14	24.02	34.58	36.97	38.85	37.5	34.0
Mal C	15.5	2.11	4.91	12.18	20.33	17.81	18.07	17.29	22.2
Fem NC	10.2	15.17	11.44	33.53	29.42	30.51	32.48	30.9	23.1
Fem C	12.6	0.29	0.0	4.91	5.85	7.49	7.45	7.72	19.9

Notes: *All refers to the 1980 model. HP: House Prices, LI: Labor Income, RA: interest and mortgage RAtes, CH: CHildren, IC: Initial Conditions.*

This policy can either by applied to the entire adult population, or only to the young adult population, i.e., households with ages between 23 and 29.

The policy increases the government's expenditure by:

$$S\rho(q_1)q_1\Big[\int_{\Omega^S}\mathbb{1}_{s=R,q=q_1}d\mathcal{S}+0.5\int_{\Omega^M}\mathbb{1}_{s=R,q=q_1}d\mathcal{M}\Big], \tag{47}$$

if applied to the entire population. If applied only to the young adults, the inside of the integral needs to include an indicator function $\mathbb{1}_{j\leq 4}$, for being a young adult. The integral for married is divided by two as two individuals live in the same house and obtain only one subsidy. The distribution of singles and married population ($\mathcal{S}$ and $\mathcal{M}$ in equations (33) and (34)) are a function of the subsidy, S, and the resulting equilibrium prices.

Table 15 shows the effect of the policy on the share of young adults who coreside, the share of married among young adults and older adults, the homeownership rate, and prices. The results are presented for three different housing supply elasticities ς_2, where $\varsigma_2 = 0.9$ is the value used in the benchmark. A 10% subsidy reduces the share of coresidents by about 5 percentage points. Furthermore, it increases the share of young adults who marry by about 5 percentage points. The decline in coresidence and the increase in marriage are much more pronounced among non-college individuals.

The comparison between the two subsidy levels, 10% and 25%, highlights the interaction between the housing and the marriage market. While the aggregate fall in coresidence share is similar under both subsidy levels, it is driven by different education groups. In the 10% subsidy scenario, there is a more significant decrease in coresidence among non-college-educated and a minor one among college ones. Meanwhile, with a 25% subsidy, the coresidence declines more significantly among college-educated, with non-college-educated males experiencing a lower decline. While a 25% subsidy lowers the cost of renting more, coresidence among non-college-educated does not decrease. This is due to the equilibrium feedback in the marriage market. When more college-educated participate in the marriage market, the gains from participation for the non-college-educated males can be lower (they are more likely to meet a college graduate, which will not result in marriage). This can be seen from the fact that marriage rates among non-college-educated do not increase in the 25% subsidy regime.

Regarding the housing market, Table 15 highlights two results. First, the share of homeowners drops significantly, from an average of 50% in the benchmark to less than 35% with a 10% subsidy and to 24% with a 25% subsidy. Second, the house prices increase by less than 1 percent, except when the housing supply elasticity is less elastic, i.e., $\varsigma_2 = 0.5$, where the housing prices increase by 1.6 percent. The significant decrease in homeownership, with a relatively minor increase in house prices, happens since the policy affects the decisions between renting and owning the smallest-sized house q_1. Households shift from owning such houses to renting them, but overall housing demand increases only slightly, with a small effect on prices. In the benchmark economy around 30% of households owned q_1 while in the counterfactuals this value is less than 10%

Table 15: Effects of Rent Subsidy: Across Scenarios

	Benchmark	Rent Subsidy 10%			Rent Subsidy 25%		
	$\varsigma_2 = 0.9$	$\varsigma_2 = 0.5$	$\varsigma_2 = 0.9$	$\varsigma_2 = 2.5$	$\varsigma_2 = 0.5$	$\varsigma_2 = 0.9$	$\varsigma_2 = 2.5$
Coresident 23-29	27.3	22.6	22.2	22.1	21.4	20.8	21.7
Male NC	37.5	31.6	31.3	31.3	35.0	33.4	35.6
Male C	17.3	15.5	15.6	15.6	10.4	10.6	10.6
Female NC	30.9	23.6	23.3	22.8	21.9	22.0	22.0
Female C	7.7	7.8	6.9	6.7	1.1	1.1	1.1
Married 23-29	34.7	39.0	39.4	39.2	34.9	34.8	35.0
Male NC	33.2	38.7	39.4	39.2	32.7	32.3	32.7
Male C	38.8	39.9	39.5	39.5	40.7	40.9	40.7
Female NC	31.4	37.9	38.8	38.5	31.0	30.5	31.0
Female C	41.1	41.1	40.5	40.6	42.4	42.7	42.4
Married 31-49	73.6	74.4	74.3	74.5	74.5	74.3	74.8
Homeowners	51.2	35.0	34.2	35.1	23.4	24.3	23.0
House Price	1.0	1.016	1.009	1.003	1.009	1.011	1.005

7.2 Reduction of Down Payment Constraint

The second policy reduces by 25,000 dollars the down payment constraint for young adults who decide to buy a house. This policy can be interpreted as a down payment assistance program for young adults, where the state guarantees a share of the down payment. However, in the model, this does not increase the government expenditure, as there is no mortgage default. Table 16 showcases the results. The policy reduces the share of coresidence and increases the share of young adults who marry by around 2 percentage points. The marriage share does not change significantly among older adults aged 31-49

Table 16: Effects of Down Payment Assistance Policy

	Benchmark	25K Down Payment Assistance		
	$\varsigma_2 = 0.9$	$\varsigma_2 = 0.5$	$\varsigma_2 = 0.9$	$\varsigma_2 = 2.5$
Coresident 23-29	27.3	25.6	26.3	25.4
Male NC	37.5	35.1	37.0	37.0
Male C	17.3	16.5	16.5	16.9
Female NC	30.9	29.0	28.9	26.1
Female C	7.7	7.0	7.2	7.2
Married 23-29	34.7	36.4	36.7	36.3
Married 31-49	73.6	73.1	73.3	73.0
Homeowners	51.2	50.4	51.4	49.9
House Price	1.0	1.003	1.001	1.002

8 Conclusions

Over the past 40 years, U.S. households have experienced significant changes. Marriage rates declined, and a growing share of young adults chose to live with their parents. Both trends have been much more significant for those without college degrees. Throughout the same period, housing has become less affordable. In this paper, I explore the effects of house prices on coresidence and marriage decisions. I first empirically analyze the role of house prices on parental coresidence and marriage, and, using geographical variations in house price increase in the US, show that higher housing prices are associated with higher parental coresidence and lower marriages. Then, I develop a quantitative model that incorporates housing prices and parental coresidence into traditional household formation frameworks. The analysis reveals that rising housing costs have played an essential role in the decline of marriage rates and the increase in parental coresidence.

The model is calibrated to U.S. data from 2019 and captures key features of the marriage and housing markets, including the education gradient in marriage and the life cycle dynamics of homeownership. The calibrated model is then used to quantify the role of the changes between 1980 and 2019 in explaining the marital decline throughout the same period. House prices, income structure, and interest and mortgage rates are among the forces analyzed. The model suggests that rising house prices alone account for nearly a third of the decline in marriage rates over the past four decades, highlighting the critical role of housing affordability in shaping marriage decisions. Furthermore, the model indicates that the increase in house prices has disproportionately affected non-college-educated individuals, contributing to the widening socioeconomic disparities in marriage and household formation.

Finally, I use the model to study government policies that make housing more affordable. I consider two revenue-neutral policies: a rent subsidy and a reduction in the down payment constraint for young adults. I find that a 10% rent subsidy reduces the share of coresidents by about 5 percentage points. Furthermore, it increases the share of young adults who marry by about 5 percentage points. The decline in coresidence and the increase in marriage are much more pronounced among non-college individuals.

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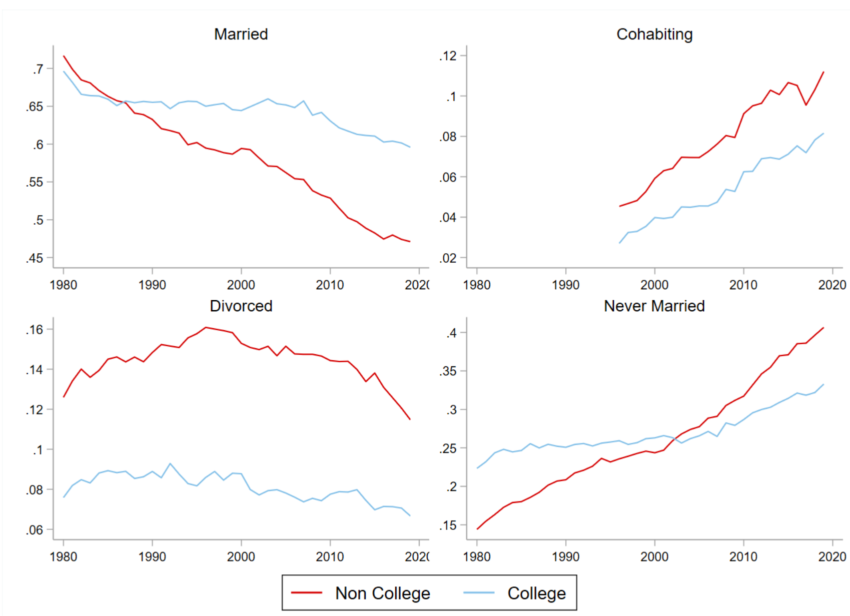
Appendix

A Historical Trends in House Prices, Coresidence, and Marriage

In this appendix I provide further information and data on the historical trends in marriage, coresidence, and marital status.

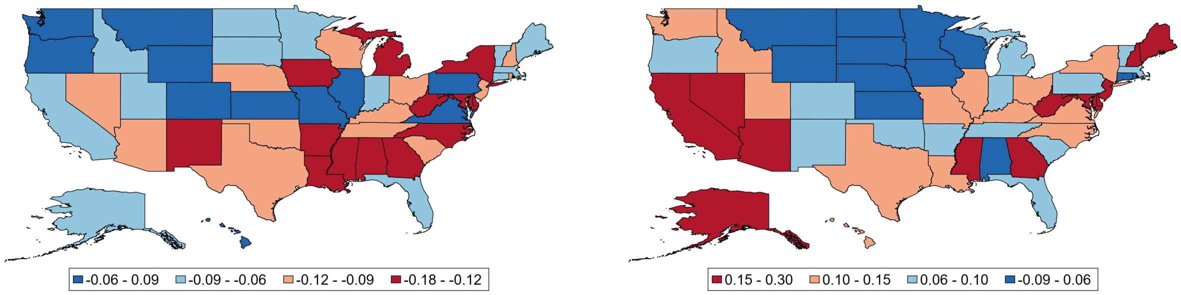
Figure A1 provides some explanation for the larger decrease in the share of married or cohabiting individuals among non-college educated. While their divorce rate is higher, this has been consistent throughout the past 40 years. Hence, it cannot account for the differential trend. Meanwhile, the share of individuals who are never married has increased steadily among the non-college educated, rising from nearly 10% to around 45%. Finally, while the share of never married among college educated in 1980 was higher, the increase has been a great deal smaller.

Figure A1: Marital Status among Adults



The maps in Figure A2a and A2b highlight 3 aspects of the decrease in marriage shares and increase in parental coresidence shares. First, there is a great deal of heterogeneity across the United States. Second, the trends are not only experienced in specific regions, but they are a nationwide phenomenon. The marriage share dropped the most in the Deep

South, Northeast, and Great Lakes regions. Meanwhile, parental coresidence increased the most in the Southwestern states of California, Nevada, and Arizona, but also in Alaska, and East Coast states such as New Jersey, Delaware, and West Virginia. Third, the two trends are not perfectly correlated across states.



(a) Married or Cohabiting among Adults **(b)** Coresidence among Young Adults

Figure A2: Changes between 1980 and 2019

Using the Census-ACS dataset, we can obtain further evidence of the changes between 1980 and 2019 in marriage and coresidence across geographic areas. Tables A1 and A2 show the share of individuals that are married or cohabiting, and living with their parents across geographic areas. I divided the areas along two dimensions. The first is whether the individual lives outside the metro area, in the principal city, or outside the principal city. For the second dimension, I divided metropolitan areas across population quartiles: individuals living in areas in the fourth quartile live in the most populated metropolitan areas.

Table A1: Marital or Cohabitation among Adults across Geographic Areas

	All			Non C			Coll		
	1980	2019	Diff	1980	2019	Diff	1980	2019	Diff
Share HH	71	61	-10	71	58	-13	71	65	-6
Individuals	76	60	-16	76	56	-20	75	66	-9
Share Male	76	58	-18	76	55	-22	77	65	-12
Share Female	75	61	-14	76	57	-18	73	67	-6
Not Metro	81	64	-17	81	62	-20	80	72	-9
Metro: Principal	65	50	-15	65	46	-19	65	54	-11
Metro: Not Principal	79	62	-17	79	57	-21	78	69	-9
Metro: Mixed	78	60	-19	78	55	-23	78	67	-12
Metro Pop.: 1 Quart	79	62	-17	79	59	-21	78	69	-9
Metro Pop.: 2 Quart	78	61	-18	78	57	-21	78	67	-11
Metro Pop.: 3 Quart	77	61	-17	77	57	-20	77	68	-9
Metro Pop.: 4 Quart	73	58	-14	73	54	-19	73	64	-8

Data: ACS. Percentages. Age group: 23-49. Cohabitation using Partner/Roomate for 1980.

Table A2: Parental Coresidence among Young Adults across Geographic Areas

	All			Non C			Coll		
	1980	2019	Diff	1980	2019	Diff	1980	2019	Diff
Individuals	15	32	17	15	35	20	13	25	12
Share Male	18	35	17	19	39	20	14	26	12
Share Female	12	28	16	12	30	19	12	24	12
Not Metro	14	27	14	14	29	15	11	21	10
Metro: Principal	15	26	11	17	36	19	12	15	3
Metro: Not Principal	16	41	25	16	42	26	16	39	23
Metro: Mixed	13	29	17	13	33	20	10	22	12
Metro Pop.: 1 Quart	11	25	14	12	29	17	9	17	8
Metro Pop.: 2 Quart	12	27	14	13	29	16	10	20	11
Metro Pop.: 3 Quart	13	30	17	14	33	19	10	23	13
Metro Pop.: 4 Quart	16	34	18	17	39	22	15	27	12

Data: ACS. Percentages. Age group: 23-29

The heterogeneity in house price increases across the USA can be observed in Tables A3 and A4 which use data from the Harvard Joint Center for Housing Studies (JCHS) and the American Housing Survey (AHS), respectively. The first table shows the house price to median income ratio across metropolitan areas. From 1980 to 2020, the ratio has increased all along the distribution. Nonetheless, it increased the most in the upper tail. The second table shows house prices in thousands of dollars across housing size. I categorized houses by the number of bedrooms they have: 0 or 1 bedroom, 2 to 3 bedrooms, and 4 bedrooms or more. The median house price increased for all three sizes of houses. It increased significantly more for the large houses i.e., 4 bedrooms and more. Interestingly, the share of large houses over the entire stock increased from 14% to 24% from 1980 to 2019, and these are mainly owner-occupied.

Table A5 shows median house prices across house sizes and geographic areas using the ACS. The geographic areas are divided along the dimensions discussed above. While the house prices from the ACS and AHS are different, the pattern of the price increase across house sizes is similar. Furthermore, the table shows that the largest increase in house prices has been experienced in the third and fourth quartiles of population.

Table A6 shows the share of households between the ages of 23 and 49 who are classified as being rent burdened. Rent burdened is defined as being a renter household spending more than 30% of household income on rent (Council of Economic Advisers, 2024). Households that reported a rent of 0 have been excluded from the calculations.

Table A3: House Prices to Median Income Ratio across Metropolitan Areas

	1980	1990	2000	2010	2020
Mean	3.0	2.7	2.8	3.4	3.9
10th Pctile	2.2	1.9	2.1	2.3	2.5
25th Pctile	2.5	2.2	2.3	2.6	2.9
Median	3.0	2.5	2.6	3.1	3.6
75th Pctile	3.4	3.0	3.1	3.8	4.4
90th Pctile	3.9	3.5	3.7	4.7	5.7
Weighted Mean	2.8	3	3.1	3.6	4.4

Data: Joint Center for Housing Studies.
Weighted Mean using population. Missing data for 1980

Table A4: House Prices across Metropolitan Areas and Housing Size

	1980				2019			
	Share	Owners	Rent	Value	Share	Owners	Rent	Value
0/1 Bdrm	14.8	18.7	6888	116357	11.8	13.0	9840	130455
2/3 Bdrms	71.2	73.4	7670	147386	64.4	64.5	11280	188447
4+ Bdrm	14.0	91.6	8378	224957	23.8	88.1	15600	335015
All	.	68.0	7447	162900	.	64.0	10920	227614

Data: AHS. Share refers to distribution across dwellings.
Rent refers to yearly rent. Rent and Value are median and expressed in 2019 Dollars

Table A5: House Prices across Metropolitan Areas and Housing Size

	All		0/1 Bdrm		2/3 Bdrms		4+ Bdrms	
	1980	2019	1980	2019	1980	2019	1980	2019
Median US	147	230	101	152	132	200	209	330
Not Metro	116	140	58	90	101	125	147	200
Metro: Princ	147	325	116	325	132	300	209	420
Metro: Not Princ	178	280	116	160	163	230	240	375
Metro: Mixed	132	245	74	142	132	200	194	350
Metro Pop: 1 Quart	132	175	74	95	132	150	178	250
Metro Pop: 2 Quart	132	200	81	110	132	180	194	283
Metro Pop: 3 Quart	147	200	81	100	132	175	209	300
Metro Pop: 4 Quart	178	300	116	215	163	250	240	400

Data: ACS. Median Values. Values in Thousands of 2019 Dollars.

Table A6: Share of Rent Burdened Households

	All			Non C			Coll		
	1980	2019	Diff	1980	2019	Diff	1980	2019	Diff
Share HH	23	35	12	24	39	16	19	26	7
Not Metro	16	25	9	16	26	10	14	18	4
Metro: Princ	27	38	11	28	47	19	23	28	5
Metro: Not Princ	22	36	14	23	41	18	18	26	8
Metro: Mixed	21	35	14	21	40	19	18	26	8
Metro Pop: 1 Quart	19	31	11	20	32	13	19	26	7
Metro Pop: 2 Quart	21	34	13	21	37	15	18	27	9
Metro Pop: 3 Quart	22	33	11	22	37	14	20	24	4
Metro Pop: 4 Quart	25	37	12	26	44	17	20	27	7

Data: ACS. Percentages. Age group: 23-49

B Role of House Prices, Coresidence, and Marriage

In this appendix I present robustness checks to the main analysis shown in section 2.3.

Table B1 shows the results of the main specification, both at the state and metropolitan level, but using the entire sample of adults, between the ages of 23 and 49.

Table B1: State and Metropolitan Level Regressions: Adults 23-49

	State		Metropolitan	
	(1)	(2)	(3)	(4)
	Coresidence	Marriage	Coresidence	Marriage
State Lagged HPI	0.00877***	-0.00243		
	(0.000)	(0.175)		
Metro Lagged HPI			0.0104***	-0.0105**
			(0.006)	(0.020)
Geo. FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Age Fe	Yes	Yes	Yes	Yes
Ind. Controls	Yes	Yes	Yes	Yes
Geo. Controls	Yes	Yes	Yes	Yes
F-Statistics	21.78	21.78	15.16	15.16
Observations	15360481	15360481	5656583	5656583

Notes: *Table shows the estimated coefficients obtained from the state and metropolitan level regression. The errors are clustered at the state level. p-value in parentheses, * $p < 0.10$, ** $p < 0.10$, *** $p < 0.10$. The analysis is at the state level columns 1 and 2, and at metropolitan level in columns 3 and 4. For each geographic level, the first colum uses coresidence status as dependent variable, the second uses marital status. All estimates are obtained by instrumenting the lagged house price index. Marriage includes cohabitation, i.e., living with a partner. The sample is composed of individuals between the ages of 23 and 49.*

Table B2 shows the estimated coefficients using a different measure of house prices. The first two columns use the lagged house prices at the state level from Zillow. Values have been standardized to have a standard deviation of 1. The third and fourth columns use current house prices. The magnitudes of the coefficients are similar to the one obtained in the main specification.

Table B3 analyzes the relationship between house price and education groups for coresidence and marriage or cohabitation. For each dependent variable there are two columns. In the first, I run the IV specification on the sample of non-college individuals, in the second I use college educated individuals.

Table B2: State Level Regressions: Different House Price Measures

	(1) Coresidence	(2) Marriage	(3) Coresidence	(4) Marriage
Lagged Zillow	0.0215***	-0.0132***		
	(0.000)	(0.010)		
Current HPI			0.0197***	-0.0143***
			(0.001)	(0.003)
State FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Age FE	No	No	No	No
Ind. Controls	Yes	Yes	Yes	Yes
State Controls	Yes	Yes	Yes	Yes
F-Statistics	8.920	8.920	17.10	17.10
Observations	3559922	3559922	3614416	3614416

Notes: *Table shows the estimated coefficients obtained from the state level regression. The errors are clustered at the state level. p-value in parentheses,* * $p < 0.10$, ** $p < 0.10$, *** $p < 0.10$. *The analysis uses standardized Zillow house prices in columns 1 and 2, and current house price index in columns 3 and 4. For each house price variable, the first colum uses coresidence status as dependent variable, the second uses marital status. All estimates are obtained by instrumenting the house price variable. Marriage includes cohabitation, i.e., living with a partner. The sample is composed of individuals between the ages of 23 and 29.*

Finally, B4 shows the estimated first stage for the instruments used. The first column shows the estimates obtained when regressing the lagged house prices index from the FHFA, the main dependent variable, on the instrument. The second column shows a similar regression, but uses as dependent variable the Zillow house prices. The third column shows the first stage results when using the metropolitan areas.

Table B3: State Level Regressions: Education

	Coresidence		Marriage	
	(1)	(2)	(3)	(4)
	Not Coll.	College	Not Coll.	College
Lagged HPI	0.0193***	0.0147***	-0.0151***	-0.00822**
	(0.000)	(0.009)	(0.004)	(0.011)
State FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Age FE	No	No	No	No
Ind. Controls	Yes	Yes	Yes	Yes
State Controls	Yes	Yes	Yes	Yes
F-Statistics	19.03	22.41	19.03	22.41
Observations	2382737	1231679	2382737	1231679

Notes: *Table shows the estimated coefficients obtained from the state level regression. The errors are clustered at the state level. p-value in parentheses, * $p < 0.10$, ** $p < 0.10$, *** $p < 0.10$. The dependent variable is the coresidence status in columns 1 and 2, and marital status in columns 3 and 4. For each dependent variable, the first columns limits the sample to the non-college-educated, the second column to the college-educated. All estimates are obtained by instrumenting the lagged house price index. Marriage includes cohabitation, i.e., living with a partner. The sample is composed of individuals between the ages of 23 and 29.*

Table B4: State and Metropolitan Regressions: First Stage

	(1)	(2)	(3)
	Lagged HPI State	Lagged Zillow State	Lagged HPI Metro
State Elas. × Nat. Lag HPI	-0.00499***	-377.9***	
	(0.000)	(0.004)	
Metro Elas. × Nat. Lag HPI			-0.00220***
			(0.000)
Observations	3614416	3559922	1375108
F Stat	20.32	8.92	14.49

Notes: *Table shows the estimated coefficients obtained from the First Stage regression. The errors are clustered at the state level. p-value in parentheses, * $p < 0.10$, ** $p < 0.10$, *** $p < 0.10$. The first two columns are at the state level. The last column at the metropolitan level. The first column uses as dependent variable the lagged house price index. The second the Zillow house price. The third the metropolitan level lagged house price index. The sample is composed of individuals between the ages of 23 and 29.*

C Calibration Details

In this appendix I provide further details on the calibration of the model.

Table C1 show the estimated parameters for the labor income process for all four demographic categories. Figure C1 shows the median biennial labor income in the estimated income process across the life-cycle.

Table C1: Labor Income Process Parameters

Sex	Edu	a_0	a_1	a_2	σ_0^2	σ_ζ^2
Male	Non College	8.957	0.079	-0.001	0.425	0.027
Male	College	7.808	0.151	-0.002	0.632	0.041
Female	Non College	9.196	0.041	-0.0	0.467	0.03
Female	College	8.152	0.123	-0.001	0.408	0.029

Figure C1: Median Labor Income

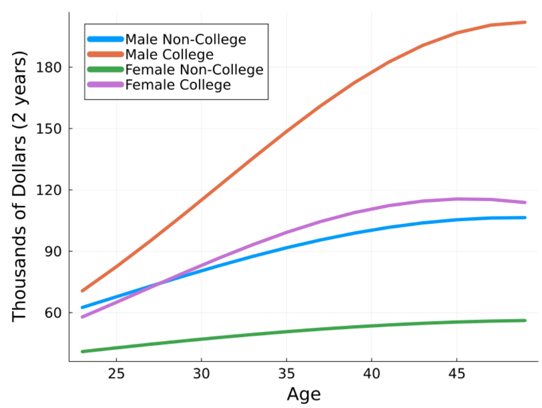


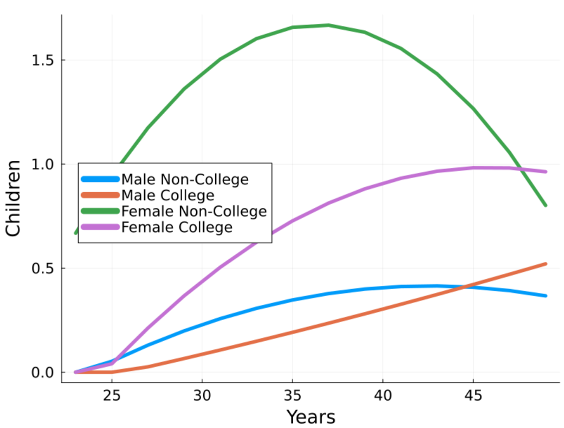
Table C2 shows the estimated parameters for the children process for all demographic categories. Figures C2a and C2b show the number of children along the life-cycle for singles and married, respectively. Among singles, males have very few children in the household. Furthermore, college educated individuals have children later in life.

Table C2: Estimated Children Function Parameters

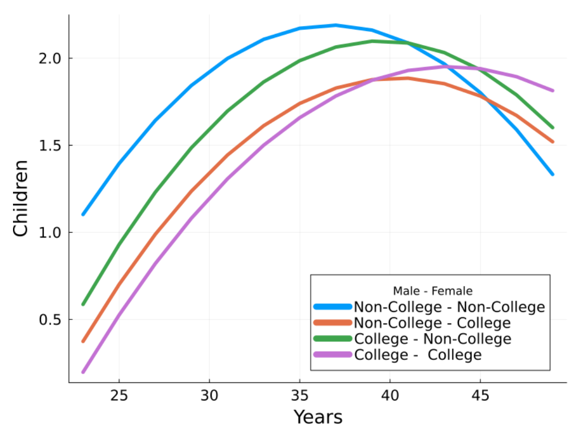
Marital	Sex	Edu	k_0	k_1	k_2
Single	Male	Non College	-1.706	0.1	-0.001
Single	Male	College	-0.414	0.013	0.0
Single	Female	Non College	-5.669	0.402	-0.006
Single	Female	College	-3.565	0.198	-0.002
Marital	**Edu Male**	**Edu Fem**	k_0	k_1	k_2
Married	Non College	Non College	-5.561	0.422	-0.006
Married	Non College	College	-6.257	0.403	-0.005
Married	College	Non College	-6.559	0.438	-0.006
Married	College	College	-6.034	0.369	-0.004

Figure C2: Estimated Children Function for Singles and Married

(a) Children for Singles



(b) Children for Married



D Decomposition Details

In this appendix I provide further details on the decomposition analysis.

Table D1 shows the estimated labor income process parameters for 1980.

Table D1: Labor Income Process Parameters for 1980

Sex	Edu	a_0	a_1	a_2	σ_0^2	σ_ζ^2
Male	Non College	9.018	0.082	-0.001	0.339	0.028
Male	College	7.798	0.153	-0.002	0.392	0.04
Female	Non College	9.158	0.039	-0.001	0.577	0.013
Female	College	10.815	-0.02	0.0	0.394	0.045

Figure D1 shows the estimated median labor income for 1980 and 2019 (dashed).

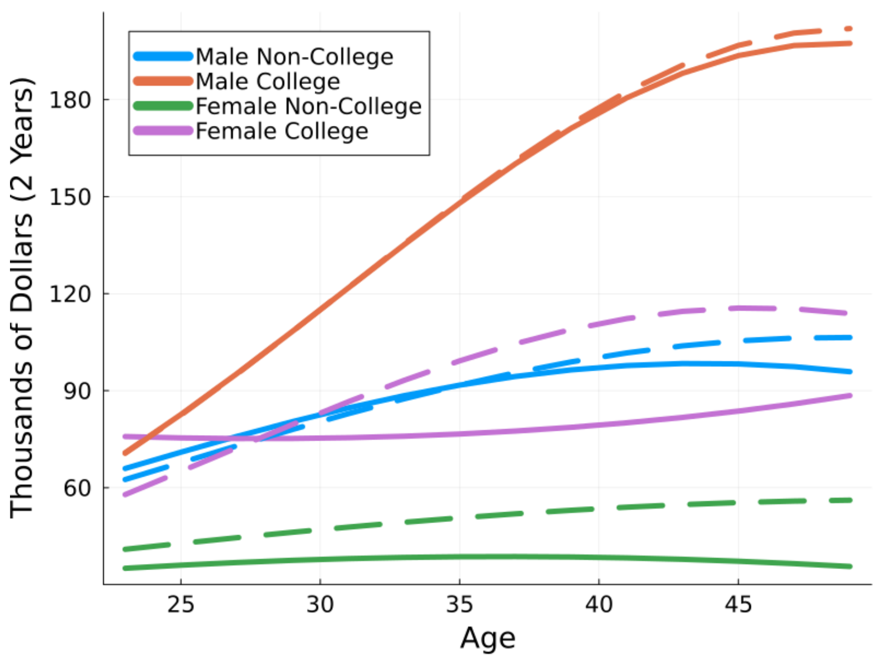


Figure D1: Median Labor Income 1980 and 2019

Table D2 shows the values of the parameters of the second order polynomial in the 1980.

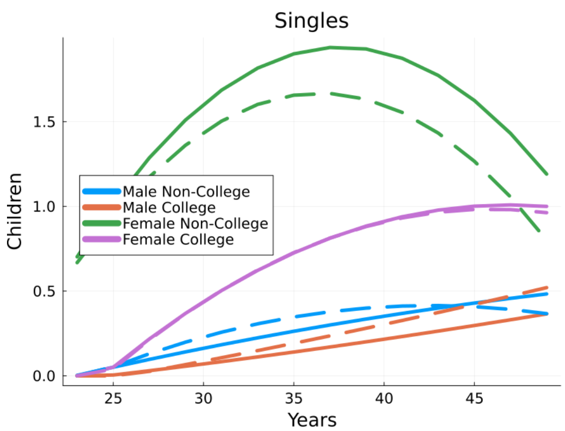
Figure D2 shows the estimated children functions for 1980 and 2019 (dashed).

Table D2: Estimated Children Function Parameters for 1980

Marital	Sex	Edu	k_0	k_1	k_2
Single	Male	Non College	-0.68	0.035	-0.0
Single	Male	College	-0.245	0.007	0.0
Single	Female	Non College	-6.255	0.436	-0.006
Single	Female	College	-3.382	0.187	-0.002
Marital	**Edu Male**	**Edu Fem**	k_0	k_1	k_2
Married	Non College	Non College	-6.803	0.473	-0.006
Married	Non College	College	-5.767	0.357	-0.004
Married	College	Non College	-7.133	0.447	-0.005
Married	College	College	-6.234	0.355	-0.004

Figure D2: Estimated Children Function for Singles and Married

(a) Children for Singles



(b) Children for Married